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ABSTRACT

To remain a high wage, high income society, attention must be focused on America's learning system. Educated workers and citizens should have a better grasp of technology, and vocational-technical subjects taught in the schools must contain greater academic, abstract, theoretical, and conceptual content. Reforming vocational-technical programs will require an emphasis on standards, motivation, modern technology, and relevance. Higher salaries and greater learning system control by teachers will also be necessary. The current trend in economic development on the state level is to facilitate private sector efforts. Among such approaches aimed at basic skills education, business/school partnerships offer the most promising alternatives. Basic requirements for a successful partnership include shared, focused goals; effective communication; and coordination. Another strategy to improve vocational education is "two-plus-two" advanced skill programs, which link the final two years of secondary education with training at a junior, technical, or community college. By offering competency-based education and alternative instructional methods for applied mathematics and science, these programs show promise for strengthening both the academic and the vocational skills of Texas' future work force. The need for information regarding the various articulation options is of utmost importance; the dissemination of ongoing pilot "two-plus-two" programs and of articulation improvement strategies will greatly support the restructuring and upgrading of vocational education throughout Texas. (72 references) (KM)

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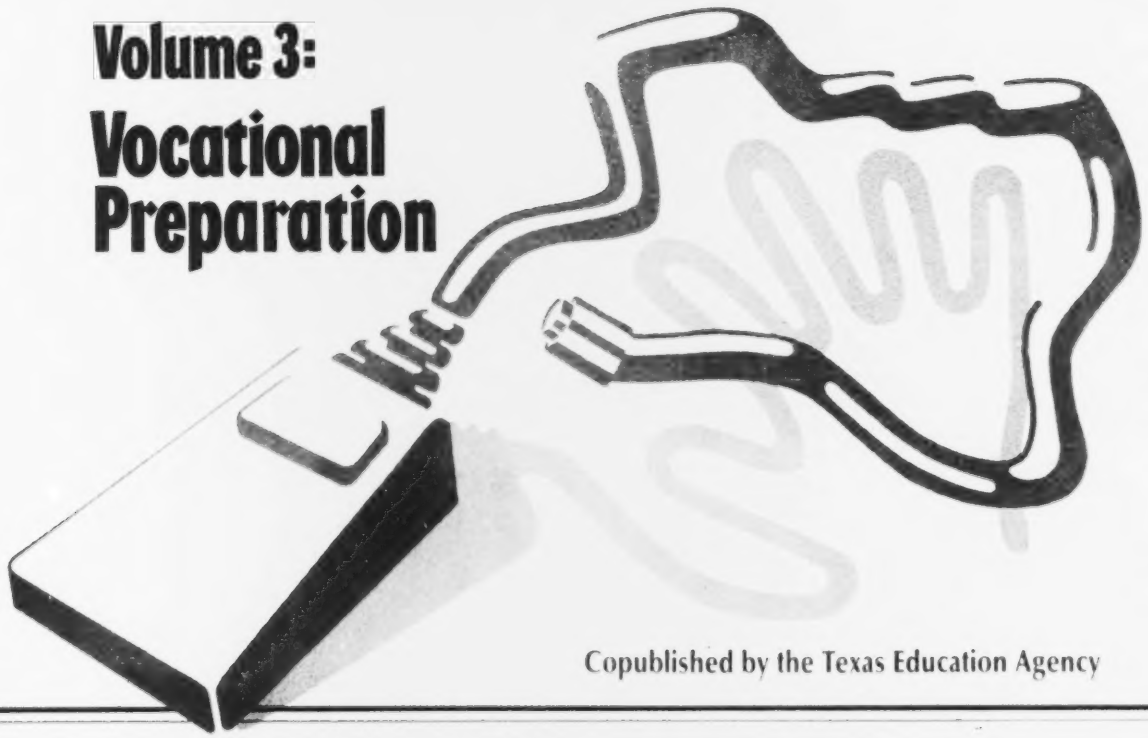

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Policy Research Project Report
Number 85

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Volume 3
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Contents

Foreword xiii

Acknowledgements xv

Chapter 1. Technology, the Economy, and Vocational Education 1
- Introduction 1
- The Internationalized Information Society 2
- Loss of Industrial Competitiveness 2
- Vocational-Technical Education 6
- Educational Equity 8
- Conclusions 8

Chapter 2. Basic Skills: The Foundation of Vocational Preparation 11
- The Need for Basic Skills 12
- Training and Formal Schooling 16
- Business Involvement in Training and Education 19
- Conclusions and Recommendations 22

Chapter 3. Vocational Education and Students At Risk of Dropping Out of School 25
- Introduction 25
- Demographic Trends 25
- Dropouts: Who and Why ? 26
- What Can Be Done? 31
- Implications of the Master Plan for Vocational Education 36
- Conclusions 38
- Recommendations 39

Chapter 4. Improving Articulation in Technical-Vocational Education between High Schools and Community Colleges 41
- Introduction 41
- Rationale for Two-Plus-Two Program Implementation 41
- Two-Plus-Two Program Models 43
- Impact of Two-Plus-Two Programs on Secondary Vocational Education 50
- Conclusions and Recommendations 51

References 53

List of Acronyms 59

Compliance Statement 60

List of Tables

Table 1. Population, Education, and Economic Characteristics by Ethnicity: 1980 27

Table 2. High School Dropout Rates in Texas, by Ethnicity and Sex 29

Table 3. Sample Advanced Placement Model: Engineering Technologies Division 45

Table 4. Sample Core Curriculum Model Using Principles of Technology: Core Technical Preparation for Electronics 46

Table 5. Sample Pretech Core Curriculum Model Secondary Component: Biomedical Equipment Technology 47

Table 6. Sample Vocational-Technical Model: Agriculture 49

Foreword

The Lyndon B. Johnson School of Public Affairs has established interdisciplinary research on policy problems as the core of its educational program. A major part of this program is the nine-month policy research project, in the course of which two or three faculty members direct the research of ten to twenty graduate students of diverse backgrounds on a policy issue of concern to a government agency. This "client orientation" brings the students face to face with administrators, legislators, and other officials active in the policy process, and demonstrates that research in a policy environment demands special talents. It also illuminates the occasional difficulties of relating research findings to the world of political realities.

In the summer of 1987, the Texas Education Agency enlisted the Lyndon B. Johnson School of Public Affairs in such a project and began a joint effort to examine the relationship between public education and the economy of Texas. Professors Ray Marshall, John Gronouski, and Robert Glover and students at the LBJ School worked closely with TEA staff in the Division of Research and Information to examine the relationship between the Texas public schools and the economic future of the state. The result of this joint effort is a series of reports concerning education, technology, and the economy.

The first of these reports, Economics of Education, by Professor Ray Marshall, focuses on current economic and demographic trends in Texas and their implications for public education. This report is followed by two additional volumes prepared by students and edited by Robert Glover and John Gronouski, addressing the issues of technology and the Texas public schools and vocational preparation and the Texas economy.

These reports provide an excellent resource for all of those engaged in the public debate surrounding education and the future of Texas. It is the hope of the LBJ School, the State Board of Education, and the Texas Education Agency that this report will enlighten and inform all of those involved in the policymaking process.

Finally, it should be noted that neither the Texas Education Agency, the LBJ School, nor The University of Texas at Austin necessarily endorses the views or findings of this study.

W.N. Kirby
Commissioner of Education

Max Sherman
Dean

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We also wish to thank several individuals who took time from their busy schedules to travel to Austin and meet with us on various aspects of this fascinating subject, including Roy Amara, President, Institute for the Future; Anthony Carnevale, Vice President and Chief Economist, American Society for Training and Development; Francis Dummer Fisher, Consultant to the PERSEUS project of Boston University and Harvard; Larry Jenkins, Chairman of the Texas Select Committee on Education; Henry Kelly, Office of Technology Assessment, U.S. Congress; Robert Taggart, President, Remediation and Training Institute; and Marc Tucker, president of the National Center for Education and the Economy.

Literally hundreds of people, both in Texas and elsewhere, were consulted or interviewed for this project. Although we cannot name them all here, we wish to thank them for their contributions.

Thanks are also due to Jeanette Paxson and Maria de la Luz Martinez of the LBJ School Publications Office for their expeditious assistance with editing and production of the publications.

Finally, we want to remind the reader that any remaining errors in the reports are the responsibility solely of the authors.

Chapter 1. Technology, the Economy and Vocational Education[1]

INTRODUCTION

A wise and influential teacher used to say to his students: "The trouble with you is you don't understand all you know." This thought is more than merely a play on words. It is a fundamental problem with a lot of us, individually and collectively. As a prime example, this expression explains our nation's views toward human resource development. We know, and say almost reflexively, that our people are our most important asset, but corporate and public policies usually give relatively low priority to education and training. Because we know that education and training are important, corporations and governments, especially state and local governments, spend a lot of money on learning -- about $453 billion, according to one estimate. Private industry spent about $210 billion of that amount for formal and informal employee training in 1986 (Carnevale, 1986, pp. 18-26). Yet until recently we really have not given much attention to how that money was spent, and we have allowed the education establishment to run itself in ways that suggest that we really have not been as concerned as we should be about the development of our people. Perhaps it is because we don't understand all we know. It is very important for us to understand the linkages between the economy, technology, and vocational education.

Unquestionably, human resource development has been critically important to economic performance in the past. Detailed and sophisticated studies by economists have consistently found that knowledge, technology, and improvements in the quality of our human resources have been responsible for an overwhelming share of our improvements in productivity and most of our growth in national income (Dennison, 1985). There is, however, some question about whether or not human resources will be as important in the future as in the past. Some argue that technology will deskill jobs and that most jobs of the future will require less education and training, while others argue that future jobs will require more education, especially technical education.

This paper outlines the most important aspects of our current economic environment, especially internationalization and the technological revolution. Many of our institutions, including our national and international policy processes and our education system, have been rendered obsolete by those developments. The consequences for the United States have been a loss of industrial competitiveness, declining productivity and real wages, and a loss of American political and economic influence in the global economy. A reversal of these trends will require considerable policy and institutional reform. Our main purpose is to explore the role of education in general and of vocational-technical education in particular in these institutional reforms.

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[1]An initial version of this paper was presented by Ray Marshall at a conference co-sponsored by Carnegie Forum on Education and the Economy and Southern Growth Policies Board, Little Rock, Arkansas, March 14, 1986. The speech was published as "New Skills for the Changing Economy." In Technology, the Economy, and Vocational Education, ed. Stuart A. Rosenfeld. Research Triangle Park, N.C.: Southern Growth Policies Board.

THE INTERNATIONALIZED INFORMATION SOCIETY

Some people characterize the emerging economic systems in the industrialized countries as "post-industrial." This term is not very appropriate because it implies that industry -- meaning manufacturing -- is no longer important. This is a serious misreading of reality. Just because agricultural employment has become a relatively small part of total employment we do not speak of the "post-agricultural" society. In a highly interdependent society, the linkages between industries are such that the employment or value added generated by a particular industry category is not descriptive of the importance or even the real nature of that sector. Even though agriculture itself only accounts for about 3 percent of employment, the food industry accounts for 30 to 40 percent. The importance of agriculture has not been reduced. Rather the functions have changed so that some activities previously performed in the home are now performed in the market, and new service and manufacturing activities combine with agriculture to produce food. Similarly, some economists imply that the relative decline of manufacturing employment is of no concern because it will be replaced by services in the "post-industrial" society. This view underestimates the continuing importance of manufacturing to the entire economy, especially to the high value-added services and for technological innovation. We cannot have a strong economy without a strong manufacturing sector.

It is more appropriate to characterize the emerging economy as an internationalized information economy because the universal imperatives of our time are internationalization of markets and the pervasiveness and impact of information technologies. Internationalization subjects domestic management and industrial relations systems to the requirements of international competition. If high-wage countries are to maintain or improve their real wages, they must place a heavy emphasis on technological innovation. The loss of technological advantage forces competition to be mainly on the basis of prices and wages, which implies declining real wages and incomes for a high-wage country like the United States. By the same logic, gains in technological advantage have the opposite effect -- witness the rise of Japan's real wages to a current level equal to that of the United States.

LOSS OF INDUSTRIAL COMPETITIVENESS

A major problem for the United States in an internationalized information world is the loss in competitiveness of much of our industry, traditional as well as high-tech. There is no question that we have lost competitiveness, but significant questions remain about the implications and causes. The best measures of our competitiveness problem are the loss of market share (absolutely and across industries), declining profitability of enterprises, declining real wages for American workers, and plant closings. These losses, in turn, have resulted in declining family incomes (workers in export and import industries are much more highly paid than those not directly engaged in the trade sectors), growing trade deficits, and rising external debt -- which implies lower standards of living in the future.

Some economists believe our loss of competitiveness was inevitable because the dominant position occupied by the U.S. in the world economy after World War II could not be sustained. Many economists also see no cause for alarm about declining manufacturing employment, arguing that it is natural for a wealthy economy to shift from manufacturing into services. Many argue, also, that our competitiveness problem has been

primarily due to misguided national economic policy, pointing to our huge budget deficit, and, as a consequence, our higher interest rates, and the overvalued dollar.

There is, of course, some validity to these arguments. It was inevitable that American industry would lose relative market share as other countries recovered from World War II. Moreover, our national economic policy has not been conducive to maintaining international competitiveness. It is not inevitable, however, that we experience declining real wages and profitability, nor is it inevitable that U.S. companies lose their share of American and world markets in areas such as telecommunications, microelectronics, and services where we have had overwhelming technical superiority.

Nor can we be complacent about the lack of manufacturing growth over the past two decades and the shift of employment growth to services, because high value-added services are related to high value-added manufacturing. If we lose a competitive manufacturing base, we will lose the banking, insurance, transportation, advertising, and consulting services related to that manufacturing. There are very important synergistic relations between technology, learning, and manufacturing. Technological innovations are made concrete by embodying them in manufactured products. The cumulative nature of technological innovation requires continuous incremental improvements. Therefore, the loss of manufacturing implies a loss of important learning opportunities. Moreover, while there are some high productivity services, generally services have lower productivity and therefore lower wages. Finally, our trade problems will not be solved by exporting services, because the international service trade is relatively small and even less open to American companies than manufacturing. Thus, manufacturing is critical to our technological innovation, and these innovations are critical to competitiveness.

Whoever owns and improves technology has a tremendous competitive advantage. If we lose our technological lead, we must compete mainly in terms of prices and wages. As a high-wage country, we will lose most wage-cutting contests with other countries, and our real wages will decline. Wage-intensive competition is one of the reasons much of the industry in the South is on its way to Third World status.

There are many reasons for our loss of competitive advantage. No useful purpose is served by assigning blame -- there is enough to go around. We must recognize that all of our major institutions are responsible because all were parts of the earlier, mainly goods-producing economy. That economy served us well from 1945-1965, but its institutions and policies are inappropriate to an internationalized information world in which we must pay much more attention to the coordination of our macroeconomic policies with those of other countries; high priority also must be given to the revitalization of floundering international economic institutions and obsolete international economic policies.

The effectiveness of U.S. economic policy has been diminished by internationalization, which weakens the effects of national policy actions oriented toward domestic markets, which often have negative effects on other countries and boomerang back to the U.S. Also, the growing complexity of the national economy requires less general or macro approaches and more targeted or selective approaches.

Above all, in an internationalized environment, federal policies must do much more to complement market forces with competitive strategies. Reactive, uncoordinated, and passive federal industrial policies cause major problems for American producers in a world where our strongest competitors have better coordinated, active strategies to strengthen

their economies, often at our expense. Public policies are important to competitiveness because they condition the climate for productive activities--especially the stability of economic conditions, the degree of competition in markets, and the cost and quality of capital, technology, and labor. It is not hard to demonstrate that much of the responsibility for the loss of competitiveness of American industry rests with inappropriate federal economic policies that have put U.S. producers at a serious disadvantage through: (1) unstable economic conditions; (2) taxes and other policies that create disincentives for productive investments while encouraging functionless corporate activities that bid up the price of existing assets and do nothing to create new wealth; (3) fiscal and monetary policies that reduce savings, increase real interest rates, and overvalue the dollar; and (4) passive and ineffective trade policies that give foreign companies unfair advantages in American markets.

What is needed at the federal level is a burst of creative pragmatism such as the U.S. experienced immediately after World War II, leading to practical, nonideological approaches to our problems. Fortunately, there is some reason for optimism because the states, which are mainly responsible for the critical human resource development functions, are currently experiencing a burst of such creative pragmatism. In our present situation, we would be in even more trouble than we are if the federal government had greater responsibility for this vital policy area. Our economic position nevertheless depends heavily on improvements in federal as well as state and local policies and on much better coordination between the public and private sectors.

Within the framework of public policies, competitiveness is mainly a matter of company strategies and management systems. Some of our companies with very good strategies have been damaged by inappropriate federal policies, but too many of our companies have obsolete management systems. Prodded by the short-run orientation of most of our financial institutions, many managers are motivated too much by short-run profits and therefore have inadequate long-run competitive strategies, which now must be global. This has caused them to neglect productivity, quality, flexibility, and technological innovation in favor of quick on-paper profits.

While strengthening our learning systems is very important to our national competitiveness, in perspective this is only one vital component of an overall strategy. The maintenance of competitive advantage for high-wage countries also requires the transformation of management and industrial relations systems. In particular, there must be much greater emphasis on flexibility, productivity, and quality output than during the 1945-1965 period, when production was mainly of goods for domestic markets and a war-devastated Europe and Japan offered U.S. industry no significant competition. Now 60 percent of the work force is in information occupations and only 25 percent is in the goods-producing sectors. Traditionally, the American system has emphasized security through growth (which was relatively easy from 1945-1965), long-term contracts, pattern bargaining, contractual rights, regulations, and fixed prices and exchange rates. International competition has caused all of these things to give way to security through productivity, quality, and flexibility.

What are the implications of these developments for skill development and learning? Some economists believe that technology innovations imply deskilling. Their view assumes that machines will replace skills and that American management, under the influence of Frederick Taylor's "scientific management" principles, will continue to stress deskilling and job fragmentation in order to give management greater control of the work.

Others argue that if U.S. industry is to effectively compete in an internationalized industrial and market economy in an era of ever-increasing technological sophistication, it will require a highly educated and skilled work force which has the competence to function in a work environment which places a premium on flexibility and adaptability to rapid changes in technology and market demands.

While no one can predict the future with assurance, the weight of evidence suggests that for U.S. firms to compete successfully in the international economy, they will need a work force capable of involvement in decisionmaking at every stage of the production process. In this environment there will be little room for well-paid workers whose level of competence is only sufficient to permit them to perform a single repetitive assembly line task. If this is the future, then for a firm to be competitive and for the maintenance of American real wage standards, workers will need a much higher level of academic and skills training than is currently the norm in the nation's elementary and secondary school systems.

Several features of what probably will be the most competitive work places also imply different skills and knowledge than that required in a mainly national goods-producing economy: More technical knowledge will be required because of the pervasiveness of technology. Technology is likely to displace workers from the least skilled work and to require workers to have more problem-solving skills. This puts a premium on conceptual (abstract) knowledge of things that are not visible. Thus, rapid change and the technical requirements of the emerging jobs will attach a heavy premium to learning skills. Production will probably be more coordinated and collective rather than individualistic. As a result, workers will need more communication skills and other interpersonal skills. They particularly will have to communicate technical material with a high level of precision.

These developments also are likely to change the relationships between workers and managers. Efficient, competitive systems will have fewer managers, and the relationships between workers and managers will be blurred. There will be fewer supervisors because the most efficient systems will have more worker participation and because information technology will displace many middle managers, whose work is mainly shuffling papers, a task performed more effectively by computers than by people. Worker participation and ownership will provide incentives for workers to become more identified with their enterprises. Identification will be required because productivity and quality output will cause workers to be more responsible for work processes. In fact, workers will have to become more heavily involved in company decisions to ensure that those decisions reflect the interests of workers and communities. The decisions of multinational corporations do not necessarily reflect the interests of their employees or the communities and countries in which they operate. American, Japanese, and other international experience suggests that workers who are motivated to maintain or improve their jobs and incomes through expanding market shares can be very competitive with multinational corporations that have high profit thresholds and attempt to maximize short-run profits. Thus, worker ownership and participation in management will require higher levels of understanding of global business strategies as well as of the technical aspects of production.

Several developments will provide greater incentives and opportunities for workers to train and educate themselves on a continuing basis. First, the availability of more highly educated workers will create competition for jobs. In some sense, supply drives demand for educated workers as much as demand drives supply, not only because the availability of

trained and better-educated workers will cause employers to select them, but also because educated-trained workers are more likely to create their own opportunities. Second, since it will be difficult to determine what individual workers do in the internationalized information world, they increasingly will be paid more according to what they know, not what they do. Flexible compensation systems that provide flexibility in adapting to changes, as well as greater incentives for quality output, will combine wages with bonuses and ownership returns.

Although traditional scientific management systems have attempted to fragment skills, they never have been able to do so completely, partly because scientific management was based on the fallacy that there was one best way to do something. In reality, there is no one best way since optimal production processes depend heavily on the realities of each work place. Scientific management also was stymied because many processes were too complex to be fragmented or transferred to machines. It is becoming clear that the most efficient use of information technology is to decentralize it to the workers -- not to centralize it in engineering departments. The flexibility made possible by the new information technology makes it possible to produce shorter production runs by simply reprogramming the computer rather than the more costly retooling required of hard automation. Hard automation permits start-up losses to be recouped through mass production--spreading the costs over more units of output. Moreover, information technology is not as easily used or as trouble-free as its producers imply. This puts a premium on high-level and flexible skills by workers on the work floor. These workers must understand both the technology and production requirements in order to correct machine errors in a hurry. Errors must be detected early; otherwise, defective components will be embedded in equipment and discovered only by massive and expensive failures.

Finally, the close relationships between enterprise successes and national policies will require educated worker-citizens who understand their policies, economies, and societies, as well as their jobs.

VOCATIONAL-TECHNICAL EDUCATION

What is the role of vocational-technical education? Some critics argue that vocational education should be eliminated or greatly minimized in secondary schooling. In this view, high school vocational education is obsolete because it prepares people for jobs that no longer exist and is inferior because it has been used as a dumping ground for poor students who are not likely to make it in superior academic tracks. The critics of vocational education also point out that the vocational-technical system is inflexible because it teaches mainly what the teachers know how to teach (agriculture and home economics), not what the students need. Instruction is carried out in necessarily unrealistic settings and with obsolete equipment. Critics usually point out that it would be much better to teach academic subjects, or basic education, and then let students learn vocational subjects on the job under more realistic conditions.

What about these arguments? There are a number of points which should be stressed: It is very difficult to generalize about vocational-technical education. In too many cases, it deserves the criticism. There clearly has been a general tendency for vocational-technical programs to be too inflexible, though not necessarily any more so than many academic curricula. On the other hand, there are many superior programs that do a better job of teaching academic subjects than their traditional academic counterparts. Nor can

there be any doubt about the need for strengthening basic literacy, mathematics, communications, learning, conceptualizing, and reasoning skills. It is impossible to have really effective technical education without these basic academic skills.

Much of the criticism of vocational-technical education is biased and ignores the values of strong vocational-technical programs, as well as their potential in a reformed education system. There is a bias in academic circles against "soft" vocational areas relative to more abstract subjects, which are considered to be more prestigious and demanding. Much of this is elitism and much abstract work may be rigorous, but also irrelevant and wrong. Some academics would rather be rigorously wrong than vaguely correct. As a consequence of this bias, many academics assign second-class status to vocational-technical subjects and therefore make self-fulfilling prophecies of their criticism of the vocational-technical education system. Moreover, when vocational-technical programs come under the direction of educators with antivocational biases, they can weaken the effectiveness of the programs by diminishing their practical technical content in favor of more academic subjects which are often unrelated to a comprehensive academic-vocational education program.

Most importantly, the critics of vocational-technical education make a false distinction between vocational and academic education. If properly taught, technical education always requires considerable academic content. This will be even more true in the future, as workers need to have higher theoretical and conceptual skills. Most abstract and academic subjects can be taught more effectively through hands-on experience than through more academic classroom exercises. Indeed, learning probably is always more effective with the unity of thought and action.

In an internationalized information world, educated people increasingly will need knowledge of technical subjects. Those societies that give attention to technical subjects probably will be able to disseminate technology much faster and make more effective use of it than those that neglect technical subjects. Similarly, educated people must understand technology in order to make intelligent decisions about it. Thus, education reform should attempt to unify technical and academic subjects, not deemphasize the former.

It is not hard to specify the action required to improve vocational-technical education. Reform must start by attracting and retaining more highly paid teachers, motivating students, maintaining rigorous standards, and combining academic subjects with training on the most modern and up-to-date equipment possible. Improving the quality of teaching sometimes will mean attracting teachers from the private sector. There is a need for much closer interaction between educators and industry, including the involvement of teachers and students in private sector research and development activities. A major requirement of upgrading vocational-technical education is more research and evaluation with respect to these programs and building research and evaluation skills into their curricula. These activities could strengthen the status of teachers and the quality of the vocational-technical learning experience. The involvement of industry leaders in education programs could strengthen education and productivity, as well as overcome the biases they both have about each other. The learning business is far too important to our economic and national welfare to let it be isolated from the economic world. Moreover, most businesses are themselves major learning systems. Some even give academic degrees. Many work places in internationalized information societies look more like graduate schools than factories.

We also need to recognize some of the same principles in reforming education as in any other system. We have to understand the nature of the existing system and the one we would like to put in its place. It is particularly important to recognize that we are dealing with systems which have interrelated components. In any system, incentives and measurements are important. You will get what you reward and measure. We cannot say we want trained intelligence in students and reward schools for average daily attendance, the quality of their athletic programs, or the political influence of their graduates. Similarly, we cannot say we want good teachers and provide little respect, inadequate compensation, or working conditions that insult their dignity and sense of professionalism. We cannot say that people are our most important asset and pay as little attention as we do to learning systems in our strategic planning -- in companies and in the country.

EDUCATIONAL EQUITY

In reforming the education system, we must not let vocational-technical subjects be ignored or continue the artificial split between vocational and academic subjects. We should discontinue the practice of dumping disadvantaged students into inferior vocational programs where this practice exists. Likewise, as we reform the system, great care must be taken not to push low-income or disadvantaged workers out of these improved learning systems. This is important for both equity and economic reasons: equity because we will not have a stable society without major attention to a more equitable sharing of the benefits and costs of change than is currently the case and economic because almost all of the net labor force growth over the next three decades will be minorities and women. In 2015 there will be 91 million minorities in the U.S., three million more Hispanics than blacks. They will be 34 percent of the population and probably almost 40 percent of the work force, because whites are much older on the average and more likely to retire. By that time, whites will be a minority of the population in our three largest states -- California, Texas, and New York. By 2080 whites will be a minority of the U.S. population. How well we educate and train minorities now will therefore have a very important bearing on the future economic and social health of our country.

CONCLUSIONS

Many of the institutions that served us well in the 1945-1965 period have been rendered obsolete by internationalization, technological change, and an increasingly complex economy. As a consequence, American companies are losing their competitive position, even in the American market and even in the high-tech areas where we should have competitive advantage. All major groups share responsibility for these problems, but major problems are caused by passive and ideologically impaired policies rather than the creative pragmatism that characterized the 1945-1965 period. Federal policies have created economic instability and have provided incentives for companies either to engage in unproductive speculative on-paper investments, to concentrate in sheltered defense industries, or to leave the United States. Similarly, traditional American management and industrial relations systems are too authoritarian and adversarial and give far too little weight to some matters that are critically important in an international information world -- especially productivity, research, flexibility, and quality.

In dealing with all of these problems, we must pay attention to human resources, which have accounted for most productivity improvements since 1929, when we started keeping such statistics, and which will become even more important in the future.

Attention must be given to our technological and organizational advantages if we are to remain a high-wage, high-income society. This requires great attention to the learning systems, one of which is vocational-technical education.

Critics argue that vocational education should be deemphasized in favor of greater attention to academic subjects, but this argument poses a false dichotomy. Educated workers and citizens must have a much better grasp of technology and vocational-technical subjects must have more academic, abstract, theoretical, and conceptual content. Moreover, these academic subjects can best be taught through the unity of thought and action exemplified by world-class vocational-technical programs.

Reforming these programs will require more attention to standards, motivation, modern technology, and relevancy. Reform must begin by attracting and retaining high-quality teachers. Higher salaries and much greater control of the learning system by teachers will be required. There must, in addition, be closer relations between learning systems and other production activities, especially elevating the learning function in strategic thinking and planning at every level.

A world-class education system will cost money, but we should view this as one of our most important investments. Human resource investments are at least as important as physical capital investments; yet this fact is not reflected in American tax policy or other economic policies. We can gain some resources by making learning systems more productive, but this will not be enough. We should remember, however, that human resource development pays high dividends, and it will be very costly to the individual welfare of Americans as well as to our national economic prowess and political power if we fail to make these investments.

Chapter 2. Basic Skills: The Foundation of Vocational Preparation

Competency attainment means more than the ability of students to take a test in school. It includes the ability of students to communicate well orally and in writing, to understand and represent quantitative relationships, and to engage in abstract reasoning and logical analysis on some basic level. It may seem inappropriate to think of a simple yes or no answer to the question of basic skills acquisition. The question of basic skills is more appropriately couched in terms of "how much?" rather than "yes" or "no." Levels of competency attainment are supposed to represent whether or not Texas students have acquired basic skills. The Texas Educational Assessment of Minimum Skills (TEAMS) test answers this question for the Texas Legislature, the state Board of Education, and the Texas Education Agency (TEA). The ability to pass TEAMS signifies a Texas student has acquired sufficient basic skills to meet high-school graduation requirements.

The following discussion addresses the relationship between levels of competency attainment and the potential for growth and diversification in the Texas economy by reviewing the literature concerning training and basic skills from the perspective of the labor force and industry. This interpretation of the research question carries with it several assumptions. First, human capital is indeed a valuable resource which is made more productive by greater knowledge and cognitive skills as they are acquired in education and training. Second, and by corollary, the absence of basic skills in a workforce limits the potential productivity of an economy. A labor pool characterized by low skills constrains economic growth and diversification. Not only are employees without adequate basic skills less productive, but individuals without good basic skills also are likely to be in need of social services, demanding resources which would otherwise be invested in the economy (Berlin and Sum, 1983, pp. 1-2; Texas Task Force on Literacy, March 1987). Third, to the extent businesses are required to teach basic skills, the school system is not providing the levels of competency attainment required by employers.

Basic skills instruction is training to develop the cognitive abilities required for effective performance in higher education or in the modern workplace. Cognitive ability includes ability to solve problems, adapt to new job environments, learn new procedures, and correctly interpret instructions. It is more than mastery of the three R's. Improvement in the economy's productivity is more dependent on the availability of high quality human capital than it is on technologically advanced physical capital. Despite the wonders of artificial intelligence, the most sophisticated computers are not a substitute for workers in the productive process who have adequately developed basic skills. The need for basic skills training will increase rather than decline as more and more computers and robots become staples of the productive process. The pressures of increasing international competition emphasize the need for high-level labor force skills (Bennett and McLaughlin, 1988, p. ii.).

THE NEED FOR BASIC SKILLS

> A strong national economy in the 1980's will require expanded industrial productivity which, in important part, is dependent on an adequately skilled work force. Yet, 13 percent of white, 43 percent of black, and 56 percent of hispanic seventeen-year-olds are functionally illiterate. (Center for Public Resources, 1983, p. i)

Estimates ranging from a low of 10-25 percent to a high of approximately 75 percent of productivity growth is attributed to human factors (Center for Public Resources, 1983, p. 3; Carnevale, 1986, pp. 18-26). Since businesses employ most high school graduates, they are concerned with the high percentages of high school graduates who are illiterate. Indeed, even President Reagan has regarded the low levels of competency in science and math as a threat to our military and economic security (Center for Public Resources, 1983, p. 1).

Several studies on the basic skills competencies for high school graduates agree that competency is essential in the following areas: reading, writing, speaking and listening, mathematics, science, and reasoning.

Reading Competencies include the abilities to:

- identify and comprehend written work and summarize ideas in their own words;
- recognize different purposes and methods of writing;
- identify the author's point of view, tone, and inferences made in the written statement;
- vary reading speed and method depending on the material; and
- define words by using clues within the text or by using a dictionary.

Writing Competencies include the abilities to:

- write standard sentences;
- organize, select, and communicate in coherent paragraphs;
- improve one's own writing through restructuring, rewriting and correcting errors;
- gather information from primary and secondary sources and write reports with the research compiled.

Speaking and Listening Competencies include the abilities to:

- constructively criticize and engage in the exchange of ideas;
- answer and ask questions concisely and to follow spoken instructions;
- identify, comprehend, and report accurately the main and subordinate ideas in what others have said;
- and conceive, develop, organize and present ideas clearly.

Mathematical Competencies include the abilities to:

- perform computations such as addition, subtraction, multiplication, division, and work with fractions, decimals, and integers;
- make and use measurements in both traditional (English) and metric units;
- make estimates and approximations and judge the reasonableness of a result;
- and use elementary concepts of probability and statistics.

Scientific Competencies include the abilities to:

- understand the basic principles of mechanics, physics, and chemistry;
- distinguish problems whose genesis is in basic mechanics, physics, or chemistry;

- and apply basic scientific/technical solutions to the appropriate problems.

Reasoning Competencies include the abilities to:
- identify, formulate, propose, evaluate, and solve problems;
- recognize and use inductive and deductive reasoning as well as fallacies in reasoning;
- comprehend, develop and use concepts and generalizations;
- and distinguish between fact and opinion (Center for Public Resources, 1983, p. 9-11).

Various studies agree that in order for the U.S. to compete in an international economy, high school graduates should be able to reason and think critically in abstract form (Carnevale, 1986, p. 29; Center for Public Resources, 1983, p. 13; Johnston and Packer, 1987, p. 116; and Lyndon B. Johnson School of Public Affairs, 1988, p. 50-51). Businesses are concerned with the declining basic skills of high school graduates because of their poor job performance which, in part, results in the loss of the international competitiveness of those businesses. This is especially true because of an increase in the use of technology in the workplace that requires workers with the aforementioned competencies.

The American public should be concerned with the lack of basic competencies and the effect of a growing minority population on the overall U.S. work force. Hispanics have the lowest percentage of high school graduates and the highest percentage of people below the poverty level, followed closely by blacks in each case. Blacks have the lowest median income of the four ethnic groups and that of Hispanics is only slightly higher.

While dropping out of school in and of itself does not necessarily condemn one to poverty and to dependency on welfare, Berlin and Sum found a high correlation between having low levels of basic skills and the following: 1) dropping out of school, 2) receiving public assistance, and 3) teenage pregnancy. Among dropouts, teen parents, and people who received public assistance that were tested on the Armed Forces Qualification Test, 52 percent of the dropouts scored in the lowest fifth of basic skills. Likewise 53 percent of the recipients of public assistance scored in the lowest fifth of basic skills as did 59 percent of the unwed parents (Berlin and Sum, 1988, p. 29-33).

Dropouts are also more likely to be involved in criminal activities, thus costing the state millions of tax dollars for judicial and penal services (Orr, 1987, p. 9). The Intercultural Development Research Association (IDRA) estimated costs to the Texas criminal justice system associated with dropping out of school to be approximately $367 million annually (Intercultural Development Research Association, 1986, p.34). On the other hand, Berlin and Sum estimate that each additional grade level of basic skills reduces the probability of an arrest by 0.5 percentage points (Berlin and Sum, 1988, p. 42), thus reducing costs to the criminal justice system. as well as to society.

Both public and private sector researchers have confirmed that dropouts experience higher unemployment rates and, when employed, earn less than high-school graduates. Orr found in a California study that graduates who had been in dropout prevention programs (usually in nontraditional classroom settings) had a 20 percent lower unemployment rate than dropouts who had not participated in these programs (Orr, 1987, p. 16). The National Governors Association has noted that employers are rewarding high-school graduates with increased pay -- as much as 59 percent more than dropouts (National Governor's Association, 1987, p. 37). Furthermore, Hahn and Danzberger have noted a

lifetime earnings gap of nearly $200,000 between male graduates and dropouts. Female graduates are expected to earn $120,000 more than female dropouts over their lifetime (Hahn and Danzberger, 1987, p. 6).

Education for many years has been considered the vehicle for improving earnings. Provided quality elementary and secondary education, all students would acquire a minimal level of basic skills; be prepared to join the labor market or attend college after graduation from high school; and have the skills needed to earn a decent standard of living. In the past several years, many states, including Texas, have instituted educational reforms, driven in part by concerns that students are not acquiring the basic skills required if American industries are to become effective international competitors.

The Texas reforms of concern here are minimum skills testing and the implementation of the Master Plan for Vocational Education. The 1986-87 school year, the state began to administer the Texas Educational Assessment of Minimum Skills (TEAMS) test, which seeks to identify "areas of weak performance in basic skills and thus allow for appropriate instructional remediation" (TEA Division of Student Assessment, 1987). The test is administered to students in the odd numbered grades and includes an exit level exam in the 11th grade which can be re-taken in the 12th grade if students do not pass. Beginning with the class of 1987, this exit test must be mastered for students to receive a high school diploma.

Despite TEAMS scores rising in 1987, no conclusions can be drawn regarding the effect of Texas school reform legislation because the test has been administered for only two years. In 1987 the test was administered three times: February, April, and May. Forty-five percent of the students failed the exit-level test. Of these 44 percent failed to show competency in basic mathematics or language arts skills after testing for the second time (Texas Education Agency, 1987, p. 1). Published TEAMS data in the form of *Texas Educational Assessment of Minimum Skills, Student Performance Results, 1987* should be analyzed by ethnic categories and regions that adequately reflect the population of the various areas in Texas. The data should be broken down on a longitudinal basis in order for any deficiencies in any of the groups to be identified and for remediation to begin as soon as possible. Also, data should be analyzed by the programs in which students are enrolled (i.e., if the student is enrolled in a vocational program, this should be noted along with TEAMS scores). While the TEAMS test has been analyzed for cultural bias, one must question why both blacks and Hispanics are scoring lower than the Anglo population. Since it is imperative that basic skills be brought to a level that will ensure preparedness for employment or for continuing through post-secondary education, corrective action in the form of remediation should continue possibly through using alternative teaching techniques such as cooperative learning programs and individualized, self-paced, competency-based instruction, delivered through a variety of media. Also, research to develop an unbiased testing instrument should be undertaken to ensure reliable evaluations of elementary and secondary students.

While the level of basic skills has important economic implications for the state, there are also adverse implications for the 33 percent of students who drop out of school. It can be safely assumed that the majority of those dropping out of school are not acquiring the necessary basic skills and given "the demographic trends in the workforce, coupled with the higher skill requirements of the economy, [one could say that this] will lead to both higher and lower unemployment: more joblessness among the least-skilled and less among the most educationally advantaged." (Johnston and Packer, 1987, p. xii). Since

basic skills will continue to play an important role in the acquisition of employment, one must take into consideration the effects dropping out of school will have on those entering the workforce.

The dropout dilemma is one of the most pressing issues in education today. The increasing skill requirements of the private sector and the internationalization of the American and Texan economies demand that solutions for this problem be identified and implemented. The United States is a relatively high-wage nation whose competitive edge has been gained through the use of modern technology to produce goods at relatively low cost. Technology is now easily transferred across international borders. This, coupled with low labor costs, has allowed Pacific-rim nations to produce less expensive goods than U.S. producers. Easily transferred technology, low labor costs, and the decline in U.S. manufacturing, suggest that we must continue to develop and use innovative technology if we are to regain our competitive edge. When necessary, we should create our own advantage. The use of advanced technology, however, requires workers who are flexible, adaptable, and well versed in basic skills.

The National Academy of Sciences compared international mathematical proficiency of high school seniors. The performance of U.S. high-school seniors ranked in the bottom 25th percentile, the lowest of all industrialized countries. Japanese students scored the highest. U.S. students performed the worst on questions concerning mathematical systems and patterns -- the very skills that underlie the industries of the future: chemistry, engineering, mathematics, physics, biology, and computer sciences (Berlin and Sum, 1988, p. 20). The lack of basic skills preparation of high-school graduates is also costing employers in terms of training, low productivity, and poor product quality (Center for Public Resources, 1983, p. 25). Anthony Carnevale has estimated that the private sector spent approximately $30 billion dollars on formal training and $180 billion on informal training of its employees in 1986 (Carnevale, 1986, p. 18). The National Governor's Association contrasted the amounts that Japanese and American employers spend on training their employees. The difference is astounding: "Toyota in Japan spends 47 cents per worker, while Motorola in the U.S. spends $200. Poorly prepared entry-level workers represent an unacceptable drag on the economic vitality of industry" (National Governor's Association, 1987, p. 37).

While U.S. companies normally spend money on job-specific training, they are finding that they also have to teach basic skills to their employees. The high level of business investment in training is in response to the growing need for a competitive workforce and competitive businesses. Unless the current level of school leavers lacking basic skills is sharply reduced, American employers will need to continue to pour billions of dollars into basic skills training for their employees, something the government is already supposed to be doing through the public education system. However, as the next section will show, businesses may have no choice in spending large sums of money on teaching basic skills to their employees because many people are dropping out before graduating from high school. The next section will also look into the role a quality vocational education program can play in reducing the dropout rate and raising basic skills competencies through applied learning.

TRAINING AND FORMAL SCHOOLING

The scope of employee training in this country is broad and extensive. Workplace training and development is roughly equivalent in size to the entire elementary, secondary, and higher education systems. Largely unrecognized, corporate formal learning has grown to be a $30 billion industry as "a silent and efficient postscript to employees' formal education" (Carnevale, 1986, p. 18). Most of this training goes on in companies after employees are hired. "Business organizations alone provide at least 17.6 million formal courses each year to almost 15 million trainees. Roughly one in every eight working Americans participates in a formal training course each year" (Carnevale, 1986, p. 20). The business of firms appears to be teaching and the business of their employees, learning.

Carnevale contends that training on the job affects individual lifetime earnings far more than does formal schooling (1986, p. 18). However, Lillard and Tan have shown that having had formal schooling provides access to job training. Formal schooling is an important determinant of postschool investments in training. The likelihood of getting most kinds of training rises significantly with the level of schooling attainment. Lack of formal education limits access to post-school investments in most kinds of job training and to resulting improvements in productivity and income (Lillard and Tan, 1986, pp. vi-vii).

Because formal schooling is the gateway to job training opportunities and because basic skills are an essential foundation for further learning , equity demands that basic skills training be accomplished effectively in schools. Those who leave school without good basic skills are not likely to have the chance to acquire either basic skills or additional job skills later through employment training. They simply will be left further behind.

While training is widespread across industries, the extent of training varies among occupations. Examining occupations overall, white collar workers receive 74.2 percent of total employee training while blue collar workers receive only 25.9 percent (Carnevale, 1986, pp. 19-21). Assuming white collar workers, on average, have more schooling, these data reinforce Lillard and Tan's findings that the further one goes in school, the more likely one is to receive job training that will raise wages and enhance opportunities. Carnevale's study showed that most formal training in the workplace is concentrated in the 25-to-44-year-old age group and among white-collar managers, professionals, and clericals. This doesn't mean that blue-collar employees don't get any training, but that their training tends to be informal, on-the-job training"(1986, p. 20). The fact that blue collar workers tend to receive informal on-the-job training makes basic skills acquisition in school, before starting a job, even more critical. Lack of basic skills means the inability to fully benefit from on-the-job training.

Other findings by Lillard and Tan establish the importance of basic skills acquisition in school for minorities and for workers in high-tech industries. Independent of other attributes, nonwhite men are less likely than white men to receive job training (1986, p. vii). Good basic skills training in school, therefore, may be more critical for minorities than it is for whites. Industries characterized by rapidly changing technology rely more heavily on in-house training (1986, p. vii). Moreover, "the transferability of prior work skills diminishes when new jobs are created in industries with rapid technical change" (Lillard and Tan, 1986, p. vii). As Texas works to expand the number of high-tech firms and the minority population of the state grows, basic skills training in schools becomes particularly crucial to the Texas economy.

Carnevale and Dennison have extended human capital theory to say that the human resource is the master economic resource. It acts as the economic catalyst that changes the material and imaginary stuff of our world into usable goods and services. As Carnevale says, "Educated, healthy, trained and spirited people are the ultimate source of economic growth" (Carnevale, 1983, p. 8). Human capital is the dominant or constraining resource in production because human input makes production possible in the first place. By corollary, there are no limits to economic growth as long as quality human capital is being developed. For this reason development of human potential should be the first economic priority.

An educated, trained workforce is essential if this country expects to hold its own in an international economy which is becoming more competitive (Berlin and Sum, 1988, p. 2). Even if technological innovation reduces specific job skill requirements in the future, most Americans will need some basic sets of reading and math skills and a degree of technical literacy to work effectively and comfortably with even the most rudimentary machinery" (Carnevale and Goldstein, 1983, p. 13). There are two ways to enhance competitiveness through the human capital component of production. The first is to lower wages, a choice which is neither welcome nor wise. The second is to improve the skills of labor so that high wages are justified by the value of labor's output. Considering its other attendant benefits, the second choice is obviously the better one. For this reason industrialists in this country have become concerned with our educational system when it is compared with that of international competitors such as Japan and Korea. Because of Texas's traditional reliance on the oil industry and its recent economic downturn, the challenge of maintaining and improving competitiveness is even greater than it is for the country as a whole. It is clear that an integral part of the strategy to meet the challenge must include basic skills education (Governor's Task Force on Vocational Education, 1988, Appendix). The critical questions to be answered in Texas are: How will schools respond to the challenge? What role will basic skills training by businesses play? How may schools and businesses work together to more effectively implement the strategy?

Other states have provided Texas with examples of how to improve both physical capital and human capital as part of long-term economic development policy. MacManus analyzed 20 state economic development programs to determine the extent to which states have attempted to link physical and human capital development programs. She found the major reason for better linkages to be a growing perception that the movement of physical capital (business location decisions) is heavily influenced by the skills and education levels of the potential workforce and that a declining state economy may be the primary reason states adopt a broader definition of economic development (1986, pp. 640-650).

A good example is North Carolina, which has placed education in a preeminent role in the state's economic development plans. North Carolina's Blueprint for Economic Development states that the role of the state government should be to facilitate economic development and diversification by the private sector. This facilitative role should include maintaining the state's infrastructure and improving the public school system (Liner, 1987, p.62).

It appears that Texas may have already learned the lesson North Carolina and other states are teaching by example. The link between economic development in the state and better results from the educational system is widely recognized. The Governor's Task Force on Vocational Education noted in its report, "Here in Texas before the 1987 legislative sessions, it was stated very prophetically that 'the flag of Economic

Development would be waved over every issue to come before the Legislature'" (January, 1988, Appendix). The purpose of the Literacy Task Force was to provide educational initiatives that can become powerful economic development tools. As the report by the task force stated: "It is time to fully recognize that there is a permanent and direct link between educational achievement and economic development" (Texas Task Force on Literacy, March 1987, p. 1). In 1988, the Strategic Economic Policy Commission of the Texas Department of Commerce held a conference at which education was addressed as a vital requisite for economic growth in the state. Furthermore, examples of a rejuvenation of private economic development efforts on the state level abound (Suarez, Interview, February 13, 1988). Part of this trend has been labor pool development as a means of retaining firms (McNamara, 1986, pp. 9-13).

The economic future of both the state and its business community largely depends on a workforce with good basic skills. The state has a growing commitment to improving basic skills education in its public school system. Private industry has historically been interested and involved in public education and publicly funded training in addition to conducting internal training programs. The next section of this paper provides background on business involvement in education and public and private training programs.

BUSINESS INVOLVEMENT IN TRAINING AND EDUCATION

Business has a natural interest in training programs. Traditionally, industry has been served by public sector training programs; however, it has become increasingly dissatisfied with the results. Business employers have complained that public education and training programs are chronically unresponsive to their needs. According to the National Alliance of Business, business employers believe they could do a better job designing and managing training programs than the government does (1982, p.4). However, as the National Alliance of Business also points out, "Business interest ... differs from business leadership" (1982, p. 2).

Despite these complaints from the National Alliance of Business, there has been private sector involvement in federal training programs. Title VII of the Comprehensive Education and Training Act (CETA) created private industry councils (PICs) for the purpose of involving local businesses in training policy. Programs under Title VII of CETA and the Skill Training Improvement Program (STIP) which came before Title VII, both involved the private sector and as a result produced higher placements rates at a lower cost per placement (National Alliance of Business, 1982, p. 1). In addition, businesses have undertaken training initiatives on the local level which have been notable for their success.

Business involvement in employment training certainly has not been limited to participation in federal programs. Historically, extensive training has been conducted by business as on-the-job training (OJT) after people are hired. OJT has been a positive alternative for business because of its clearly demonstrated effectiveness, and because it tends to be more flexible and less expensive than other types of training. Despite the general satisfaction with OJT, it has limitations. Its effectiveness would be improved if it were supplemented by other types of training. Suggested ways to supplement OJT include basic classroom training in theoretical or academic concepts that cannot be taught on the job (Levitan, Mangum, and Marshall, 1976, p. 214).

In addition to OJT, there are notable examples of past business efforts to run substantial training programs on their own. Two successes include a 390-employee IBM plant in Bedford-Stuyvasant, Brooklyn, New York and a Digital Equipment Corporation (DEC) plant in Springfield, Massachusetts. The IBM plant opened in 1969 as a conscious effort to employ inner-city minorities and support central business districts. The enterprise began by chalking up an 18 percent absenteeism rate and losing money. The company invested in in-plant training after work and a program of reimbursing employees for tuition for local vocational courses. In two years the plant showed a profit (Beam, 1987, p. 87). As notable as this success, however, is the fact that IBM did not try the experiment again. DEC has made its Springfield plant (which began in the mid-1960s with 160 black and Hispanic employees) a success not only by investing in training programs, but by adopting a corporate strategy which made the plant crucial to the production of a new product line. Together, its training programs and DEC's bold production strategy have resulted in a successful plant which now employs more than 800 people (Beam, 1987, p. 88).

The Trainability Diagnosis program is another innovative approach to basic skills training which has come out of the private sector. Brown and Williamson Tobacco Corp. in Macon, Georgia has employed a trainability diagnosis test which determines who gets what kinds of training. The test is essentially an aptitude and ability test without biases for previous training, sex, or minority status inherent in other tests. The purpose of the

program is to better target training and thereby reduce its costs. In 1984, diagnosis cost Brown and Williamson $210 per person and basic skills training cost $175 per person (Casey, 1984, pp. 89-91).

Although past initiatives by businesses have been interesting and in some cases very successful, there are limits to what they can achieve. Admittedly, IBM and DEC have done wonders in their inner-city plants. However, they are just two of fifteen plants which were opened in central cities during the mid-1960's. Nine of the fifteen have since been either sold or closed (Beam, 1987, p. 86). Clearly, business training efforts could use appropriate support from the public sector. Brown and Williamson's diagnosis program is an interesting and innovative part of a company's basic skills delivery system, but in addition to determining what kinds of training are appropriate, it may also screen employees from training altogether. Some would call this another form of "creaming," training only the brightest candidates and thereby skewing program results.

The Job Training Partnership Act (JTPA) of 1982 was, in part, a response to industry's need for a better approach to training by the public sector. JTPA was intended to remedy some parts of CETA that had become inefficient or problematic. Under JTPA 800,000 economically disadvantaged people are trained per year, and 60 percent of them are placed in jobs. Most of these are trained for specific jobs either at job-training centers or government-aided OJT programs (Blumenthal, 1987, p.1). The JTPA is generally considered to be an improvement over earlier federal training policy, but it is not without its own inefficiencies and problems.

The appropriate balance between private and public support for training programs, especially basic skills training programs, is still being explored. There are currently many different programs being conducted throughout the country, with varied success and primarily on a small scale. Similar efforts within Texas in the future can be shaped by these examples.

Business/School Partnerships

Partnerships offer direct interaction between business and schools. They imply a sustained relationship with each working toward shared and agreed upon goals (Levine, 1985, p. 16). Currently there are a great number of partnerships, each involving different levels of corporate and community involvement. However, there is great unevenness in the performance of many of these projects. Some are very substantial; some are almost trivial. Some last a long time and become a durable part of the educational program; some fade in a year or two. Success seems to depend heavily upon the level of commitment of the leadership on both sides. If the leadership remains interested in these projects, then the projects remain vital. If responsibility is delegated to the lower levels of management, the programs tend to shrivel (Timpane, 1984, p. 7). In addition, long-term programs are hard to sustain in times of economic downturns and are often the target of budget cuts. However, these programs can have substantial returns and unlike taxation of business to support schools, partnerships offer businesses an opportunity for evaluation and restructuring involvement to maximize benefits.

Control Data Corporation's involvement in education has been an excellent example of one company responding to what top management sees as a social responsibility as well as an investment in the future. It is a partnership that has evolved, using the strengths of

the company and schools to benefit both. At one time Control Data gave grant money to educational pilot programs at either the college or elementary/secondary level. These grants have given rise to cooperative efforts in development and delivery of materials in areas where both the school district and Control Data have a vested interest in the success of the effort. One cooperative effort currently in operation at the elementary/secondary level is an attempt to retain top teachers by providing them with additional income for writing instructional software. Many teachers leave their profession for better paying positions with industry and at the request of school district officials this program was developed. The school district provides the educational expertise, methodology, intellectual content, and testing ground for the materials. Control Data provides market research, marketing expertise, and teacher training in layperson programming and courseware development as well as distribution of the final product. The program calls for royalties to be paid to the instructor(s) who write the programs (Levine, 1985, p. 27).

The Boston Private Industry Council has demonstrated what a group of companies can do through an intermediary organization. In 1982 a plan to improve the quality of Boston's public schools was drawn up and set into action by the business community, the school system, and city officials. That plan, now known as the Boston Compact, focused on five measurable goals: to improve attendance rates; to increase reading and math achievement; to increase college enrollment; to expand employment opportunities; and to reduce the dropout rate (Jane C. Edmonds & Associates, Inc., 1986).

In order to achieve these goals each partner -- business, city, and schools -- undertakes specific actions. Businesses sign a hiring pledge to fill vacancies when possible with high school students and graduates as well as provide career specialists in high schools to help students find jobs and excel in the workplace. Public schools begin outreach programs to increase attendance as well as more rigorous curriculum to improve math and reading skills as measured by standardized exams. The city offers support and coordination so that each partner can realize its specific goals. The results of this program have been quite impressive in achieving positive steps toward each goal, particularly in increasing employment but also in attendance, and in improving student math and reading skills. While there are obviously many things going on in the city that comprise the environment and also affect these goals, the Compact provides a good model. Many businesses working with the schools to improve education can develop a much more effective program than can a single company.

Partnerships vary in objectives and characteristics; however, several common traits of successful partnerships are:
1. They have specific, realistic, and mutually agreed upon goals.
2. They focus on the instructional core -- students, teachers, principals.
3. They involve leveraging of both financial and human resources.
4. They focus on one or more of the following specific objectives: curriculum and skill development; employability; and management and leadership (Committee for Economic Development, 1985, p. 92).

Some examples illustrate how partnerships have focused on the specific objectives stated above. For instance, DEC and Intel in Arizona, in conjunction with the Paradise Valley Unified School District in Phoenix, Arizona have begun developing and teaching improved curricula in basic science, computers and electronics (Center for Public Resources, 1983, Appendix xii). Also, Rexnord Corporation "employs teachers for six weeks during the summer in real rather than make-work jobs, to emphasize the importance

of sound basic skills for job performance" (Center for Public Resources, 1983, Appendix xii). These companies have made the curriculum of the school district their focus.

Jobs for American Graduates is a cooperative program between business and school systems across the country which focuses on employability. It helps high school seniors who are not planning to attend college to find jobs by improving their basic and job-related skills. The program's success is demonstrated by the Delaware chapter, which reported only 3 percent unemployment for its graduates of the program in 1981 compared to 19 percent for the control group (Center for Public Resources, 1983, Appendix xii).

The common traits which seem to make success possible for the examples presented above would also be present for business-school partnerships to improve basic skills in Texas. Both schools and businesses want students to graduate from high school with better basic skills. Basic skills acquisition is a goal which focuses on the instructional core of schools. What remains to create the environment for a successful partnership is a well-designed program and the commitment of financial and human resources.

CONCLUSIONS AND RECOMMENDATIONS

Workers with good basic skills are critical to economic productivity and development in Texas. In order to move forward, to grow and to diversify its economy, Texas must be able to draw on a labor force which can learn and adapt to a changing employment environment. Good basic skills, acquired either in school or through training, assure the ability to learn in the future.

In an effort to diversify its economy, Texas has attempted to attract and cultivate firms in high-tech industries. Texas also has a large and growing minority population. Because minorities tend not to receive employment training as often as whites, and because high-tech industries tend to make heavier use of internal training, Texas faces the challenge -- the imperative -- of providing for effective basic skills acquisition by all students in the public schools.

The federal and state governments, and the private sector have tried many different approaches to training. From federal programs such as the Comprehensive Employment and Training Act of 1973 (CETA) to its successor, the Job Training Partnership Act of 1982 (JTPA) to one-time programs utilized by individual firms, these approaches have varied in scope and success. The current trend in economic development on the state level is to facilitate private sector efforts. This effort is also being adapted for education. Because states view improving education as part of their overall strategy for economic development, several , including Texas, have adopted the approach of encouraging industry involvement in education.

Among the approaches to basic skills education which have involved the private sector, business/school partnerships offer the most promising alternative. Partnerships tend to be effective because they are coordinated in terms of needs and goals. The logic of involving the business sector is clear. Historically, businesses have been interested in job-specific training programs. More recently, however, the changing business structure has made basic skills the most important of employers' needs from public school systems.

Simply put, "Corporations and businesses have a stake in the improvement of our schools, and many communities are benefitting from partnerships..."(Bennett and McLaughlin, 1988, p. iii.).

Requirements for successful partnerships between business and schools include shared, focused goals, effective communication, and coordination. These requirements can be met in Texas; once they have been, a business/school partnership can improve the delivery of basic skills education.

The need for business involvement in education is gaining widespread recognition by business firms and their associations throughout the nation. The same can be said for business in Texas. In addition, the Texas Education Agency, the Governor's Office and the Texas Department of Commerce are well aware of the importance of education for the state's economic well being. Both private and public actors seem ready and willing to do their parts, once those parts are clearly defined.

TEA should encourage the development of business/school partnerships. TEA efforts to improve basic skills education could only be enhanced by the support of the business community. An excellent starting point is to determine the basic skills needs of business and to build support for partnership structures to assure such skills are acquired.

Chapter 3. Vocational Education and Students At Risk of Dropping Out of School

INTRODUCTION

The State Board of Education (State Board for Vocational Education) was directed by House Bill 72 (68th Texas Legislature, second called session, 1984) to implement various educational reforms in Texas. One measure directed the Texas State Board of Education to develop a master plan for vocational education. This paper discusses issues raised by the adoption of the Master Plan for Vocational Education (TEA, January 1987) regarding implications for students at-risk of dropping out of school.

The Master Plan for Vocational Education serves as the blueprint for restructuring vocational education in Texas (TEA, January 1987, p. 1). The Master Plan affects three areas of education: 1) elementary and secondary vocational education; 2) post secondary technical, vocational, and adult education; and 3) vocational regional planning. This paper addresses the first section of the Master Plan (elementary and secondary vocational education).

The Master Plan is guided by seven basic principles of education. The first principle states that education must prepare students for productive lives in the changing Texas economy; students must be prepared for new and emerging occupations, not just for jobs that are in demand today. Second, vocational education must be a supplement to, not a substitute for, academic skills. Third, academic and vocational courses should be integrated, with an emphasis on providing academic foundations. Fourth, the curriculum must be flexible. It must be designed to foster student options, not foreclose them at an early age. Fifth, the curriculum must be adaptable to students with special needs. These students should not be tracked into low-level jobs. Sixth, the system for developing career opportunities must be accountable. Students must be adequately prepared to meet current and emerging needs of business and industry or to continue their education at the post secondary level. Finally, funding must drive needed changes in vocational education (TEA, 1987, p. 1-2). All of these principles can have a positive effect on vocational education and for students at-risk of dropping out of school.

The Texas economy will undergo important changes and will demand increased basic skills competencies of its youths in order to compete effectively both nationally and internationally. This paper summarizes state and school demographic changes which Texas faces. It then reviews who drops out and why. From an examination of the literature on dropouts, this chapter summarizes the data evaluating the effects vocational education programs that have been in use have had on the dropout problem.

DEMOGRAPHIC TRENDS

The population of Texas is undergoing important changes. One of the major issues confronting the state is the pattern of its population growth. Population projections by Marshall and Bouvier (1986) project growth for both the state as a whole and for its minority groups.

The population projections show that much of the overall growth of the state of Texas is due to growth in the Hispanic population. Indeed, in one scenario, the Hispanic population is projected to increase from 23 percent of the state's population in 1985 to 32 percent by 2010 while the Anglo population will decrease from 63 percent to 51 percent over the same period. Of the four ethnic groups in the study, Hispanics and Asians will grow the fastest. Hispanics will nearly double their population (from 3.7 million to over 6 million) during the same 25-year period. The Asian population will more than double (from 305,000 to over 700,000). The black population will remain relatively steady; it gains just under three-quarters of a million for the 25-year period, resulting in a decrease from 12.5 percent to 11.9 percent relative to the general population by the year 2010. During this same period, Asians will grow from almost 2 percent to over 4 percent of the general population (Marshall and Bouvier, 1986, p. 28).

Equally as important as population projections are social characteristics such as educational attainment and income levels of the total population. The Hispanic population is lagging far behind the rest of the population in high school graduation rates as well as college attendance (table 1). These data show clearly the urgency of developing effective dropout prevention programs as well as admissions and retention programs at institutions of higher education.

The projected student population over the next 25 years shows a continuous decline in the Anglo population while the minority population increases. In 1985, there were 1.99 million Anglos and 978 thousand Hispanics enrolled in Texas public schools; 51 percent of the school age population was Anglo and 32 percent Hispanic (Marshall and Bouvier, 1986, p. 61). By the year 2010 the total school aged population will have more than doubled; however, the Anglo population will amount to only 44 percent of the projected enrollment while the Hispanic school aged population will have grown to 39 percent.

The importance of these demographic changes is easily seen when looking at the disparity in the level of basic skills competencies and school dropouts among ethnic groups, and the impact this will have on the competitiveness of U.S. and Texas businesses. Possible solutions to these problems will be addressed in subsequent sections.

DROPOUTS: WHO AND WHY?

The issue of a declining standard of living due to high levels of dropouts, low levels of basic skills, low productivity, poor product quality, and international competition is clearly important. We must, therefore, seek answers to the following questions: Who are the students that drop out of school? Why do students drop out of school? What can be done to curb such attrition?

In the past, the issue of defining a dropout was largely left to individual school districts with some marginal guidelines set by the Texas Education Agency (TEA). School districts recognized the fact that there was a dropout problem; however, they differed in their definitions of dropouts "despite the guidelines for dropout identification disseminated by the TEA in 1985 for Annual Performance Report purposes" (Intercultural Research Development Association, 1986, p. 3). As a result of the IDRA survey project on dropouts, the Texas Legislature in 1987 adopted a common definition and mandated preventive action, including guidelines for identifying students at risk of dropping out of

Table 1: Population, Education, and Economic Characteristics by Ethnicity in 1980.

Characteristic	Anglo	Hispanic	Black	Asian & Other
No. of Persons	9,370,023	2,982,583	1,688,947	187,638
Percent of Population 25+ Who have completed High School	70.1	35.5	53.1	68.7
4+ Years of College	20.35	5.61	9.15	31.34
Median Family Income	22,162	13,293	13,064	19,994
Percent of Families Below Poverty	5.7	24.7	24.1	14.7

Source: Marshall, F. Ray and Leon F. Bouvier. 1986. Population Change and the Future of Texas," 1986, p. 21.

school. The legislature also directed that all data collected on dropouts using the common defintion be entered in the Public Education Information Management System (PEIMS). According to the definition established by the Texas Legislature, a dropout is a student: 1) who does not hold a high school diploma or the equivalent; 2) who is absent for a period of 30 or more consecutive days from the public school in which the student is enrolled; and 3) whose attendance within that period at another public school or a private or parochial school cannot be evidenced (TEA 1988, p 37).

With a definition of a dropout in hand, the next question is how should the dropout rate be calculated? Dropout rates can be calculated in at least two ways. One way is annually; the other is in cohort groups on a longitudinal basis. Calculating the dropout rate annually entails counting, for example, all seventh-grade students at the beginning of the year. Once adjustments have been made for in and out migration of the student population, a count is taken at the end of the year, and the differences in the beginning and year-end counts provides the annual dropout rate. The other method for calculating the dropout rate is to use longitudinal cohorts over a time frame of several years. The longitudinal method tracks the cumulative number of dropouts among a particular group of students, usually a group expected to graduate together (IDRA, 1986, p. 6). From this, the dropout rate for the cohort can be calculated.

The legislature has required that the dropout rate be calculated both cross-sectionally and longitudinally for each grade seven through twelve (TEA, 1987, p 36-37). This inherently includes both the annual method and the longitudinal cohort method.

The cohort method is more effective because it provides us with the actual dropout percentages and portrays the seriousness of the problem. Therefore, "schools should collect such data longitudinally, from [the seventh grade] through graduation" (Hahn and Danzberger, 1987, p. 11). Hahn and Danzberger provide an illustration of the aforementioned groupings and why the cohort is more accurate than the annual method:

> In Chicago the dropout rates have been tabulated annually, rather than according to how many starting freshmen actually receive diplomas four years later. Thus, if 15 percent of a freshman high school class drops out in a given year, the official dropout rate is put at 15 percent. Yet, four years later when the students gather in the school auditorium to receive their diplomas, only half of the original class may still be in school. Using a multiyear tracking system based on graduation statistics, the Chicago Board of Education found that the city's dropout rate was 50.7 percent. Even more surprising was the high dropout rate among ***all*** students: 38 percent for whites, 56 percent for blacks and 57 percent for Hispanics.(Hahn and Danzberger, 1987, p. 10)

The IDRA conducted one of the most thorough surveys of dropouts ever made in the state of Texas. Their sample included a total of 1,529 high school students who were identified as possible dropouts. Through both telephone and written surveys, IDRA staff were able to contact a total of 318 students. A majority of those interviewed had dropped out. They estimated the dropout rate for the students who entered the ninth grade in 1982-83 and who were supposed to have been members of the twelfth grade in 1985-86 to be 33 percent. IDRA noted that the results of their survey (contained in table 2) are conservative for several reasons: 1) some students dropped out of school in primary and middle school

Table 2. High School Dropout Rates in Texas by Ethnicity and Sex

Group	Percent
Anglo	
Male	28
Female	26
Total	27
Hispanic	
Male	47
Female	43
Total	45
Black	
Male	36
Female	31
Total	34
Asian	
Male	34
Female	31
Total	33
Native American	
Male	51
Female	38
Total	45
All Groups	
Male	35
Female	32
Total	33

Source: Intercultural Development Research Association. 1986. Texas School Dropout Survey Project: A Summary of Findings. San Antonio. p. 11.

and thus were not included in the survey; 2) some students are lost in the transition from middle to high school and the study omits this population; and 3) at the other extreme the study also omits students who may have dropped out in the twelfth grade.

Who are the students that drop out of school? The dropout rate for Texas statewide was conservatively estimated by IDRA to be 33 percent. For Hispanics and native Americans the percentages are much greater than the overall state average. However, among families of low socioeconomic status, there is some evidence that Anglos have a higher dropout rate than blacks or Hispanics (Brown, 1987, p.2). In Texas, Anglos comprise the largest number of dropouts of any group: 230,000 versus 196,500 for Hispanics, 64,300 for blacks, and 6,200 for other groups (IDRA, 1986, p. 25). Nevertheless, members of minority groups have a greater chance than Anglos of being poor, a low achiever, and a dropout. Also, males show a somewhat overall higher tendency to drop out of school than females. Therefore, male minority group members have higher dropout rates than other populations.

Much of the literature reviewed in this study acknowledged that students leave school for a variety of reasons including poor academic performance, too many absences, marriage, economic reasons, location of the school (inner city schools and rural schools have higher incidences of attrition than do other schools), high student/teacher ratio, dislike of school, pregnancy, alienation from peers, alcohol and substance abuse, learning disabilities, lack of self esteem, not being enrolled in college preparatory classes, attitudes of teachers and school administrators, and financial crises at home leading to the need for employment (Batsche, 1985; Hahn and Danzberger, 1987; IDRA, 1986; National Governor's Association, 1987a; Naylor, 1987; Orr, 1987; U.S. General Accounting Office, 1987; and Weber and Mertens, 1986).

While all of these play important roles in determining who drops out of school, it is clear that attitudes of people in positions of authority, that is, teachers and administrators, can have a very important role in the students' decision to leave school. Hahn and Danzberger note that when an attitude of failure is conveyed to students, it usually turns into a self-fulfilling prophecy (Hahn and Danzberger, 1987, p. 15). Students who are a grade or two behind in their class work (the ones that need remediation most) end up feeling, mistakenly, that the labor force is the only place they can succeed and be productive. Their best alternative appears to be to drop out of school. Long before this point is reached, teachers and school administrators should identify potential student dropouts and implement programs designed to help them develop positive attitudes toward themselves and the value of remaining in school.

The chances of dropping out of school increase for students who are characterized as having a low socioeconomic status. Poor children drop out at more than three times the rate of more advantaged children (National Governor's Association, 1987a, p 36). Also, dropouts most often come from families where one or more family members have dropped out of school. A lack of basic skills, "combined with either poverty status or minority group membership, is an even stronger predictor of [school] failure" (National Governor's Association, 1987a, p. 37).

WHAT CAN BE DONE?

The foregoing discussion gives some indication of which students are dropping out of school and why. Attention is now directed toward the content of some dropout prevention programs that have had limited success and vocational education's role in meeting this challenge.

What can be done to remedy the dropout dilemma? A litany of studies have reached similar conclusions regarding the content of effective dropout prevention programs. However, because some elements are politically volatile issues, they have not been instituted. Listed below are some measures that can be taken to decrease the state's dropout rate.

There is no one single way to prevent youths from leaving school nor to encourage out-of-school youths to return to school. Generally, however, preventive programs "involve retraining and increasing the number of counselors; implementing a comprehensive health and family planning program; providing infant care facilities in the school for teen-age mothers; developing strong programs of cooperative education and in-school apprenticeship programs; offering remedial instruction and establishing a liaison between the school and social services agencies in the community" (Hahn and Danzberger, 1987, p. 31). Family life courses can decrease the number of teenage pregnancies as demonstrated by the effectiveness of such courses in Minnesota. There are many approaches to dropout prevention. Orr categorizes the approaches into six groups: supplemental services, removal of barriers to continued education, comprehensive school-affiliated programs, services for out-of-school youth, school systemwide approaches, and citywide approaches (Orr, 1987, pp. 20-22).

Supplemental Services include supportive counseling and job readiness preparation programs. Orr proposes that this type of service be used for youth still in school but who are at risk of leaving school due to lack of self esteem, alienation from school and peers, or who have no post-high school plans.

The Removal of Barriers includes programs designed to help youth who have left school because of family, pregnancy, or economic difficulties at home. The main idea behind these programs is to help students manage their responsibilities in such a manner that allows them to complete school. For example, school-based day-care centers allow teenage mothers to complete school while their children are provided quality child care. Orr contends that because these types of programs focus on external problems, they can often be funded through state and federal sources specifically designed for these types of services.

Comprehensive School-Affiliated Programs are geared to students who suffer from serious academic and attendance problems. The content of these programs include counseling services that encourage students to stay in school and providing services that deal with the sources of the students' problems.

Services for Out-of-School Youth are for students who have already dropped out of school. Programs in this area do not function on the assumption that dropouts will return to school, but rather focus on the development of basic skills, passing the GED test, and helping the clients gain employment skills.

School Systemwide Approaches focus on prevention. Recognizing that many students leave school due to the boredom often associated with a traditional classroom setting, programs in this category seek alternative ways to teach and reach students with different educational needs.

The Citywide Approach stresses the need for the community around students to come together to help at-risk students stay in school. It looks to universities, businesses, and social agencies for support. This method reflects the fact that society as a whole is affected by students dropping out of school. Because of the high dropout rate among minorities, universities will not be able to achieve racially mixed student bodies. Business costs will be affected by low worker productivity, poor product quality, and the need to train employees in basic skills. The state's social agencies, especially the Departments of Human Services and Corrections, will require ever increasing budgets. That it is clearly in everyone's interest to support dropout prevention programs provides the basis for this approach.

Vital to all approaches is revamping instruction and curricula to reduce the dropout rate. The nontraditional methods of teaching can help keep students' attention, and will "alleviate the boredom that secondary students often cite as a reason for wanting to leave school" (National Governor's Association, 1987a, p. 48).

Because of the lack of longitudinal data regarding vocational education and its effectiveness in reducing the dropout problem, most of the following discussion is based on descriptive studies. Until the Public Education Information Management System (PEIMS) has been in operation long enough to provide a longitudinal analysis, descriptive studies are the only available alternative.

In a survey report on school dropouts and dropout programs, the U.S. General Accounting Office (GAO) noted that while their survey responses offered "neither detailed guidelines for additional efforts nor conclusive evidence for what works, they [did] provide information about programs that local administrators [saw] as effective" (GAO, 1987, p. 13). Most administrators (90 percent of those surveyed) felt that two factors overwhelmingly influenced the effectiveness of dropout prevention programs. These were a caring and committed staff, and a nonthreatening classroom environment. Seventy-five percent or more of the respondents cited "low student-teacher ratio, links to social service agencies, individualized instruction, and program flexibility, such as in curriculum and hours, as important elements of effective programs" (GAO, 1987, p. 20).

The content and primary objectives of dropout prevention programs surveyed by the GAO varied. The majority of the surveyed programs listed three primary objectives: 1) improve academic performance, 2) change the attitude of the student, and 3) reduce absenteeism. Only 27 percent listed job training/placement as the primary objective of their program. However, most programs provided career counseling (68 percent), job search assistance (62 percent), and job skills training (55 percent). While only 1 percent of the surveyed programs listed vocational education or job training and jobs as having a negative effect on furthering the students' education, slightly more than 6 percent stated that more vocational education and work experience were needed. Many programs offered basic educational skills, career counseling and job training as part of their curricula. The GAO also examined programs that had a majority Hispanic population, since this population had a higher incidence of dropping out. The GAO noted that most Hispanics come from low

socioeconomic backgrounds, and the programs that served these students "sought to place more of the youth in part-time jobs in order to help them with their economic situations."

Texas should pay careful attention to avoid tracking minority students into coordinated vocational-academic education (CVAE) programs. Students enrolled in a vocational-academic program, just as all other students, should be prepared to pursue post-secondary training or education and encouraged to continue learning after school. Because not all students will continue their schooling through college, every school leaver should be well versed in basic skills in order to compete effectively in the labor market. Students will be able to compete effectively if they learn applied basic skills. As a component of dropout prevention programs, vocational education provides students with concrete rather than abstract methods of learning such basic skills.

Catterall and Stern, using data from a longitudinal survey to compare nonparticipants with participants in dropout prevention programs which included a vocational education component, used three methods to attempt to determine the impact of vocational education on dropout incidence (1986, p. 78). One method simply asked students if they were likely to drop out of school. Despite their participation in dropout prevention programs, 21 percent of those who responded in the affirmative dropped out, while only 6.5 to 12.1 percent of the students who gave a negative response and who participated in dropout prevention programs subsequently dropped out of school. However, Catterall and Stern placed little confidence in the results obtained because there were only twelve students in the survey who said they were likely to drop out while participating in a dropout prevention program (1986, p. 80).

Their second method, using logistic regression analysis, yielded mixed results; they found no consistent, significant association between dropping out or staying in school and participation in vocational education or alternative dropout prevention programs (Catterall and Stern, 1986, p. 80).

Their third model compared schools with similar numbers of students dropping out instead of looking at students with similar characteristics. In this study, they found that dropouts were less likely to have participated in alternative programs with a vocational education component. They concluded that while they could not dismiss the findings of this model, their results were mixed.

Perhaps the strongest evidence on the power of vocational education to hold students in school is found in Mertens, Seitz, and Cox (1982) who used a longitudinal data set containing information on grades, academic ability, alienation from school, and other background characteristics. Controlling for these characteristics, they concluded that taking and passing one vocational course each year from 9th through 11th grade raises the high school completion rate of dropout prone youngsters from about 64 percent to 70 percent. Likewise, other recent studies of the impact of vocational education on dropout rates have similarly concluded that vocational education lowers the dropout rate (Lotto, 1982; Weber, 1987).

Naylor (1987) concluded from an analysis of several studies that effective vocational education increases self esteem, the lack of which is one of the many reasons people drop out of school. She contends that students who take enough vocational education courses to be considered concentrators usually improve their school attendance and, therefore, school retention rates. Her analysis of the literature identified eight

elements of dropout prevention programs, most of which were based on vocational experiences, that should help reduce dropout rates: 1) more systematic and intense efforts to identify and help potential dropouts before or at entry into vocational programs; 2) program activities to enhance school climate and reduce absenteeism, class-cutting, and drug and alcohol abuse; 3) activities to enhance parents' support; 4) more career exploration prior to high school; 5) improvement of transitions through a vocational program to direct dropout-prone students to job-specific skills training courses; 6) linking structured worksite training experiences with students' programs and objectives; 7) alignment of worksite training programs to students' overall school plans and goals, and 8) activities to increase dropout-prone students' participation in vocational programs and to enhance linkages between these programs and other school experiences.

Batsche (1985) states that while reviews of the literature on vocational education are mixed in regard to its effect on at-risk students, there are ways of improving the vocational education classroom that will make it more exciting and, therefore, increase its retentive ability. She notes that while students say they drop out of school for stereotypical or socially acceptable reasons, dropouts inadequately articulate the real reasons for dropping out of school. The real reasons, she contends, are because of isolation, boredom, dissonance, and irrelevancy. While vocational education has had mixed reviews with respect to its overall retentive ability, Batsche notes that her review of the literature (other than that cited by Naylor) indicates that it does have a positive effect on students if they concentrate in vocational education courses, are enrolled in business education, and are enrolled in structured worksite training such as cooperative education. These areas of vocational education were found to decrease absenteeism.

Batsche concludes that caring instructors can make the difference in keeping students in school. Teachers can change the classroom environment through their styles of teaching, making school more attractive to students. Effective teaching techniques include the following prescriptions for teachers:

- Establish rules and communicate them clearly to students.
- Identify learning outcomes and acceptable standards of performance.
- Communicate this information to students so they know what is expected of them.
- Use instructional methods, procedures, and learning aids that are appropriate for the tasks being taught.
- Define a sequence of learning and communicate the steps leading to successful completion.
- Post a written schedule of activities.
- Utilize positive reinforcement to increase the probability of appropriate behavior.
- Utilize frequent and immediate reward systems.
- Relate learning activities to each student's career plan and goals.
- Develop rapport with students.
- Communicate with students on a level that reflects respect for individuals.
- Stimulate the work environment in the classroom.
- Use a reward and consequence system used in the world of work.
- Provide students with information on how, when, and where to obtain assistance in areas such as counselling and financial aid.
- Encourage all students to participate in class discussions and demonstrations.
- Utilize active questioning techniques.
- Design opportunities for students to succeed.
- Select instructional objectives that are appropriate for each student.

- Provide numerous opportunities for students to practice tasks in one area before moving on to new areas of instruction.
- Reward students for making acceptable progress -- not just for successful completion.
- Provide sufficient time for teacher-directed, structured practice before students begin to work on their own.
- Provide continuous, precise and informative feedback to students as they perform tasks; don't just assign grades to completed projects (Batsche,1985).

Weber and Mertens (1986) concluded that vocational education helps reduce the dropout rate, but only as a component of a broader dropout prevention program. Likewise, Hamilton argues that dropout prevention programs should have several characteristics, including a strong vocational emphasis in which students learn practical, job-related skills in school and apply academic learning to real-life situations. In addition, he stresses that learning should be structured to occur outside the classroom, often in connection with paid employment (1987, pp.314-45).

In the mid-1970's, Grasso and Shea, on the basis of logistic regression analysis, concluded that vocational education and the completion of high school were positively correlated, but that the coefficient for being enrolled in vocational education was not significant (1979). As students progress through high school, they take more vocational courses. The authors thus concluded that these students were accounting for the positive relationship between graduating from high school and being enrolled in vocational education courses. Their study noted that there was virtually no relationship between high school completion and vocational education. However, for men there was a significant negative relationship between taking occupational courses and completing at least one year of college. On the other hand, women who took business and office courses had a positive relationship with completing at least one year of college.

While the studies cited ranged from none to some in their conclusions on the correlation between vocational education per se and the persistence of dropout-prone students, they indicate a much stronger correlation if the vocational education program is realistic and work oriented and is the centerpiece of a broad-based dropout prevention program which responds to the myriad factors that contribute to the decisions of large numbers of students to leave school prematurely. A vocational education curriculum can be a vital part of a dropout prevention program if it is developed in an environment with effective, caring teachers, low teacher/student ratios, flexibility in curricula and hours, and in which academic subjects are taught and learned in the context of real life situations, such as structured worksite training found in good programs of cooperative education, apprenticeships, or internships. In such an environment student self esteem will grow, absenteeism will diminish, and, of critical importance, students will be far more likely than in a purely academic program to understand the need for and develop the interest in learning the basic skills so essential both in the work place and in post-secondary education and training.

IMPLICATIONS OF THE MASTER PLAN FOR VOCATIONAL EDUCATION

Given what is already known concerning dropouts and vocational education and its effects on dropouts, this section evaluates the Master Plan for Vocational Education and assesses the first section of the Master Plan for students at-risk of dropping out of school.

The implications of Texas's growing population and the need for a more competitive workforce is clearly stated in the Master Plan. The Master Plan rightly stresses the need for basic skills and calls for the development of programs to close the achievement gap between students enrolled in vocational education and other students. This can be accomplished with a renewed emphasis on basic skills. Criteria for evaluating whether or not the achievement gap is closing must be developed. TEAMS tests for vocational courses should be developed as a way of evaluating students within vocational education. Other methods for evaluating students should be used as much as possible, (e.g., teachers' evaluations of students or employers' evaluations of cooperative education students and PEIMS for analysis of vocational education's effect on at-risk students).

The literature on dropouts points out the need for flexibility in both curriculum and hours; one program described in the GAO report maintained hours of Monday through Friday, 7:30 am until 9:30 pm (1987, p. 77). The Master Plan encourages such flexibility and calls for schools to be open to provide for maximum utilization of facilities.

Equally important is accessibility to all programs for all students. This means the elimination of bias based on race, color, national origin, sex, handicapped status, age, or language proficiency regarding all programs, including vocational education. Developing support systems for students with special needs is crucial to their continued attendance in secondary schools. This is especially true of teenage mothers who need day care and other services to continue their education. However, while providing programs and services for the handicapped, disadvantaged, and students with limited English proficiency, administrators should be aware of possible tracking of such students into less demanding courses. These students should be encouraged, as any other students, to acquire the marketable skills or continue into post-secondary education or training. Adequate resources should be provided to support these programs. Pilot programs are needed to test whether programs are successful with respect to students' acquiring the necessary skills and their continued enrollment in school. It is important that all teenage parents (male and female) have access to such successful programs.

Career guidance activities for at-risk students have been identified as a key component of effective programs because they will make all students aware of the skills needed to succeed in the labor market (GAO, 1987, p. 18). Career guidance activities should include information regarding apprenticeships that allow for personal and career growth. Schools should actively seek apprenticeships and other opportunities for post-secondary training for their students, especially in fields that will be growing in the future. These opportunities will help students obtain jobs that pay higher than the minimum wage. Hopefully, such efforts will impress upon students the need for furthering their education.

Encouraging the development of self-esteem through involvement and success in hands-on activities can be helpful in reducing the dropout rate. Many students at-risk of dropping out of school exhibit lack of or low levels of self-esteem. Providing students with successes in a vocational setting will help keep these students in school.

Both the Long Range Plan for Education and the Master Plan for Vocational Education call for the accurate identification of slow learners and the provision of appropriate assistance to them. Accurate identification of at-risk students is crucial. Much of the literature cited slow learners or students who are a grade or two behind their classmates as prime candidates for dropping out of school. It is for this reason that Coordinated Vocational-Academic Education (CVAE) courses should be evaluated for their content and success in providing students basic skills competencies. These classes have the potential to stem the tide of students dropping out of school only if they provide at-risk students with practical skills. Local evaluation teams should evaluate these courses for student attendance and practicality. If CVAE courses are found to push more students out of the class than they are holding students in school, they should be eliminated. If, for example, the vocational course on duplicating practices (V.E.H. eight-digit course codes 12670100 and 13670100), is offered, its effectiveness should be evaluated. Also, what are the goals of this class? Does it provide the student with practical and marketable skills? How are basic skills competencies applied in this class? Will the student be able to make above the minimum wage by participating in that course? Will there be a demand for the skills students will learn from the class in years to come? In reviewing vocational courses, school district officials should ask these questions.

Courses in life management skills also help in raising students' self-esteem and aid in character development. Since many at-risk youth drop out because of pregnancy or marriage, parenting courses for both males and females, as well as nutrition and self-responsibility courses may help deter students from becoming parents and dropping out of school. Likewise, communication skills will play a positive role in the search for employment. The topic of managing resources such as personal finances will undoubtedly help in making the student a productive member of society.

Renewed emphasis on basic education, work ethics, attitudes, and work skills is essential in making at-risk students productive as wage earners as well as in both their personal lives and in society. Research indicates that employers look for these traits in potential employees.

Many students leave school because they do not perceive their coursework as relevant. Developing courses that use innovative and motivational strategies focusing on the practical applications of math, science, social studies, or language arts will most likely prove to be an asset in reducing the dropout rate. Therefore, these programs should be developed and implemented as soon as possible.

As with the general education program, teachers in vocational education should be competent in their fields. They should also foster a warm and nonthreatening environment, inspiring and encouraging students to reach their full potential. This can be accomplished through developing a rapport with students and showing that they care about students. Vocational education has been seen as a positive component of dropout prevention programs only when there has been individualized attention for the students. One way to facilitate this is to assign a small number of at-risk students to one teacher. An adequate number of teacher aides should be assigned to such teachers, who will be mentors for the entire period of the students' middle-school and high-school years.

Using current labor market information, such as that provided by SOICC and employers, to allocate funding for proposed courses will enhance the practicality of

vocational courses. Information will have to be shared by the Texas Employment Commission (TEC), school districts, regional planning centers, employers, and the TEA. These groups will have to communicate the needs of the labor market in the form of priority occupations to the state Board of Education for funding of proposed courses. Schools will then have to ensure that they are teaching their students practical skills or not receive the proper funding weight.

The community -- especially employers -- can play an active role in helping vocational education reduce the dropout rate. Increased contact with businesses through apprenticeship programs would help students in their short-term economic needs as well as provide them with skills they will be able to use in the future. Adequate incentives will be needed for employers to participate in such a program. These incentives may include tax breaks, decreased unemployment insurance payments, and the advantage of having trained their own personnel.

As students are identified as at-risk of dropping out of school, it is essential that they are provided information on career opportunities through studies in occupational investigation at the 7th and 8th grades and other means. At-risk youth need to know their options regarding employment so that they can appreciate the value of remaining in school.

Phasing out occupationally specific courses in the 10th grade may not be the ideal for at-risk youth[1]. This policy should be reconsidered if vocational education is going to be used as an integral component of dropout prevention programs. Providing at-risk students opportunities to work while continuing school may help keep them in school, therefore, cooperative education, apprenticeships, and other structured worksite training arrangements should not be ruled out by the TEA or individual school districts. At-risk youth should have the opportunity to participate in effective worksite training programs, or they may drop out of school altogether in order to earn money to help maintain their families.

CONCLUSIONS

The Texas economy is in a state of change. It is changing from one based primarily on oil and agriculture to one that includes an expanded service base and advanced technology. As the economy changes, so too will the skills required to work in that economy.

The population of Texas is also undergoing fundamental changes. The state will experience a growing minority population, while the percentage of Anglos will decrease and the black population will remain steady. Most of the growth will occur in the Hispanic population; in fact, fully 50 percent of all projected growth in school enrollments across Texas will be Hispanic children. Minorities will comprise a majority of all school-aged children by the year 2000 (TEA, December 1988, p. 14). In many districts this has already happened. Considering that the chances of a person being poor and becoming a dropout increase with minority group membership, the demographic projections speak for

[1] An existing provision does offer some flexibility in providing occupationally specific courses for those 10th graders who are over age for their grade level.

themselves in terms of its implications for a declining standard of living. However, if given adequate opportunities to succeed in school, minority dropout rates can be reversed.

The growth of the minority population, whose members are on the average are poorer and have lower levels of minimum skills as measured by the TEAMS test, suggest that Texas businesses will have trouble acquiring the human resources required to compete nationally or internationally. Unless Texas school-age students are well versed in basic skills, the state may not be able to attract industry. If industry is attracted, many Texas residents will not be employable in higher paying jobs because they lack basic skills competencies. In order for Texas to be a high-wage state, Texas schools must improve their performance in basic skills training.

The state Board of Education recognized both the need for the Texas population to acquire basic skills and the need to become competitive. They resolved this by adopting the Master Plan for Vocational Education, which emphasizes the teaching of basic skills.

This chapter has focused on the group of students at risk of leaving school prior to graduation. Because dropouts leave school for a variety of reasons, there is no single remedy for this problem. However, it was found that most dropout prevention programs contain an occupational component. There is mixed evidence as to whether the occupational/vocational component was effective in keeping students in school. The lack of longitudinal data on vocational education and its retentive ability proved to be a problem in that there is very little empirical evidence showing a correlation between staying in school and enrollment in vocational courses. This chapter, therefore, relied on descriptive studies. Most studies found vocational education to have a positive effect on retaining students.

Preventing at-risk students from participating in vocational education may have a detrimental effect; they may end up leaving school in order to find employment. If students can be offered a paid work component, such as an apprenticeship or cooperative education, while continuing their schooling, the dropout rate may be reduced.

High-quality vocational education programs can have positive effects on at-risk youth. While parts of the Master Plan for Vocational Education will have some positive effects on potential dropouts, others will have a "pushing out" effect. One example is the phasing out of occupationally specific courses. If the policies set forth are more flexible for at-risk youth, then vocational education can work for these troubled youths.

RECOMMENDATIONS

Dropout prevention programs should have a vocational education component. The state's emphasis on retaining at-risk students may be helped by using vocational education's active, practical, and concrete learning methods. While the evidence is mixed, most studies have concluded that vocational education's applied learning techniques have kept students in school. Most successful dropout prevention programs maintain career counseling, job-search assistance, and job-skills training. Counselors need to monitor these programs in order to ensure that students are provided practical learning leading to employment opportunities. Implementing these three components may require additional funds to hire counselors.

Since many youths drop out of school because of pregnancy, school-based day-care centers may facilitate the return of these students. The day-care facilities also can be designed to provide parent training, career development, and employment for the parents, as well as quality care for the children. Since problems may arise in such a complex program, this initiative should be implemented through pilot programs in order to iron out any wrinkles prior to full-scale implementation. Other social service agencies (Texas Employment Commission, Texas Department of Health, and Texas Department of Human Services) can provide services for both the father and mother through school-based facilities helping both stay in school.

Cooperative education programs, apprenticeship training, and other effective forms of structured worksite training should be developed. A program involving the Texas employment service could be developed to help students acquire part-time employment, possibly leading to permanent employment after the students have completed high school. Continued part-time employment should also be contingent on successfully completing school.

Any vocational education program that is designed to prevent dropouts should maintain a low teacher/student ratio to permit individualized attention.

Contrary to the Master Plan, vocational education courses that are used for dropout prevention should include occupationally specific training prior to the tenth grade. Flexibility is the key to keeping students in school and allowing at-risk students to work while continuing school may help in their retention. Therefore, this policy should be reconsidered for students at-risk of dropping out of school.

Since funding drives programs, it is imperative that dropout prevention programs be adequately funded if they are to succeed. House Bill 1010 required that dropout prevention programs be funded with Compensatory Education funds. Funding at this level may not meet the needs of all programs, and their implementation may not be as enthusiastic as it should be to make it successful. Vocational education courses that are specifically used for dropout prevention may require higher funding weights because of the prescribed low teacher/student ratio and the higher costs of equipment used in vocational courses. Therefore, if vocational education is used as a dropout prevention method, vocational weights should be used to fund these courses. This would ensure that the courses offered by school districts will be adequately funded. These courses will need to be evaluated to ensure that they are successful in retaining students. The state Board of Education should seek a legislative change regarding funding of vocational education courses that are used for dropout prevention.

School funding must be revised to provide incentive for retaining students at-risk of dropping out of school. Because funding is distributed on the basis of enrollments during only a four-week period, the current method for funding school districts does not give schools incentive to keep students in school past October. New incentives should be devised based on student enrollment throughout the year. Incentives could even be structured to keep at-risk students in school. For example, a count of students identified as at-risk who are still in school at the end of the school year could be used to boost school district funding, thereby creating an incentive for schools to work extra hard at keeping such students in school.

Chapter 4. Improving Articulation in Technical-Vocational Education Between High Schools and Community Colleges

INTRODUCTION

Education reform in Texas has included measures to improve both the traditionally academic component of the comprehensive high school and measures for improvement of secondary vocational education. In 1987, *Career Opportunities in Texas: A Master Plan for Vocational Education* was adopted by the State Board of Education and the Texas Higher Education Coordinating Board. The plan outlined goals and strategies to guide improvement of vocational education throughout the state. Two-plus-two programs, which link vocational education at the secondary and postsecondary levels, were among the strategies outlined in this document. Generally, two-plus-two refers to articulated curricular planning which provides for continuous learning experiences for the final two years of secondary education through completion of a vocational/technical program offered by a junior, technical, or community college. Over the past several years, increased interest in two-plus-two programs has been precipitated by the need for a more efficient and effective method of educating and training students to meet the needs of a changing labor market. The influx of new technologies into various sectors of the labor market has resulted in the need for workers possessing skills and knowledge different from those gained in traditional vocational education programs. Two-plus-two programs offer a promising option for restructuring vocational education so that the skills gained by program participants match those required in the workplace.

The impetus for initiation of two-plus-two programs in Texas derives from the state mandate that secondary/postsecondary articulation be established for vocational programs. To date, no directives as to the structure the articulation process must take have been given, although programs representing each of the models for two-plus-two articulation are currently operating within the state.

This chapter focuses on the likely impact of two-plus-two program implementation on the current structure of vocational education, as well as on the nature of the training that program participants are likely to receive. To a large extent, the influence of two-plus-two programs will depend on the programmatic structure adopted at the state and/or local level. Therefore, a considerable portion of this discussion will be devoted to the characteristics of the various two-plus-two models and their effects on vocational education.

RATIONALE FOR TWO-PLUS-TWO PROGRAM IMPLEMENTATION

The efficacy of vocational education has been heavily debated over the past several years. Critics question the appropriateness of job-specific training at the secondary level. They maintain that time used in learning skills destined to be obsolete by the time students enter the job market could be better utilized in the acquisition of basic and other academic skills.

Proponents of vocational education, however, argue the value of vocational programs both as source of motivation for students who learn better from a "hands-on"

practical approach to instruction and as a vehicle for providing entry-level job skills to students who will not continue their education beyond the secondary level. Using a variety of outcome criteria, numerous studies have sought to determine the effects of participation in secondary vocational education as compared to participation in the general secondary curriculum. From an extensive review of literature related to the outcomes of secondary vocational education, Louise Fitzgerald (1985, p.14) concluded that regardless of the outcome criteria used (e.g., earnings, unemployment status, additional education completed, attainment of basic skills), the following conclusion seems justified: vocational education yields meager, if any, advantages to its graduates beyond those conferred by a general curriculum." Fitzgerald, however, contends that comparison of vocational education with other types of education is not an appropriate focus for evaluating the worth of vocational education programs. Rather the significant question is How well does vocational education do what it is attempting to do? Answering this question may yield more useful information as to how vocational education may be structured to meet its goals.

Traditionally, high-school vocational education has had the goal of preparing individuals for work beyond unskilled labor (Fitzgerald, 1985, p.14; Seckendorf, 1984, p.17). Vocational education was included as a component of the comprehensive high school in response to skills, knowledge, and work attitudes required by industry in the early 1900s; skills and knowledge which were not being addressed by the classic curriculum predominant in public high schools at the time. Since their inception, vocational education programs have endeavored to convey to students the skills required by existing and anticipated jobs in the labor market.

The labor market currently is experiencing both content and compositional shifts due to technological advancements. The introduction of industrial technologies in the manufacturing sector, for example, is resulting in a shift away from a production mode which relied on proportionately larger numbers of craft persons (i.e., drafters, mechanics, and electricians) and assemblers to one which will rely on proportionately larger numbers of engineers, technicians, and operators (Hull, 1987, p. A3). While older manufacturing organizations were able to function with skilled and semi-skilled workers possessing basic skills and possibly on-the-job training, the current trend in manufacturing is a structure which will require a more highly skilled and broadly educated labor force (Tucker, 1985, p. 5). This trend is also observable in other sectors of the labor market as employers increasingly seek workers with strong basic skills, better training in math and science, and attitudes conducive to the productivity goals of the business rather than workers possessing only vocational skills (Averill, 1984, p. 39). Indeed, Richard Clinton (1984, p. 45) predicts that the gap between courses traditionally labeled academic and courses traditionally labeled vocational will narrow, as skill levels required for entry-level work in the office and industry increase due to technological advancements.

Increasingly, a large number of jobs require more than a high-school diploma, but less than a baccalaureate degree (Parnell, 1985, p. 150). However, it has been recognized that many jobs in technical areas will require substantially more training than can realistically be accomplished in the eleventh through fourteenth years of vocational education as presently organized (Bottoms, 1984, pp. 8-9). Two-plus-two programs can better meet the challenges of producing broadly educated, technically proficient individuals through a structured curriculum that integrates both academic and vocational learning experiences.

A coordinated curriculum between secondary and postsecondary institutions would reduce the duplication which often exists between the eleventh and fourteenth years of vocational education, leaving more room for teaching occupationally related skills as well as traditionally academic course material required to support the acquisition of technical skills. Students in post-secondary programs would not waste time (and money) repeating studies providing knowledge and skills already acquired at the secondary level, employers would obtain better educated and better trained workers, and the existing confusion over the appropriate roles of secondary and postsecondary institutions in providing vocational training would be minimized, if not totally eradicated.

A structured program of study for secondary students planning to continue their education through the postsecondary level has existed for decades. The specific courses outlined for college prep students are designed to provide them with the skills and knowledge believed to promote success at the college or university level. Similar programmatic guidance for secondary vocational students would be provided by two-plus-two programs. The implementation of two-plus-two programs as a method for structuring curricular content both at the secondary and post-secondary levels, thereby building a bridge to facilitate the transition from secondary to post-secondary education, is likely to have far-reaching positive benefits for students, educational institutions, and employers.

TWO-PLUS-TWO PROGRAM MODELS

The name "two-plus-two" is used indiscriminately to describe articulation programs which differ in both scope and structure. All two-plus-two programs share the goal of reducing the duplication in vocational training which often exists at the secondary and postsecondary levels. Two types of programs have been suggested, both of which include models currently used by school districts throughout the nation (Long et al., 1986, p.vii). Time shortened programs and advanced skills programs differ in both the process used for articulation as well as in the curricular structure required at both the secondary and post-seondary levels in order for the program to work effectively.

Time Shortened Program Model. The major thrust of time-shortened programs is to reduce the length of time required to complete a certificate or an associate degree in applied science (A.A.S.) at a community, junior, or technical college. These programs often take the form of an advanced placement model, which awards college credit for courses taken at the secondary level. Some institutions using the advance placement model award credit based on an acquired competency basis. Most, however, award credit based on course completion.

Advanced placement models are currently the most frequently used form of secondary/postsecondary articulation in the nation (Long et al., 1986, p. 62). Within Texas, the articulation program used by the Texas State Technical Institute-Waco (TSTI) most closely resembles this format. Normally, the chairperson of individual programs at TSTI visits individual school districts to determine which courses are similar to those offered by the institute. Credit is thus awarded on a course completion basis, and students entering the institute upon completion of high school receive college credit for skills and knowledge acquired at the secondary level (Harry E. Clair, telephone interview, February 8, 1988). Normally, students are able to reduce the time needed to complete a certificate or an A.A.S. degree by no more than one semester.

This model calls for the least structural change in secondary vocational education programs and would probably be the least costly to implement. Little, if any, coordinated curriculum development takes place, as the postsecondary institution determines which courses taken at the secondary level receive credit. Since credit is awarded on a course completion basis, there is no guarantee of parity in curricular content among the 600 school districts the institute serves. Additionally, the focus of articulation appears to be vocational courses, with little attention given to supportive courses which would lead to the broadly educated worker employers increasingly seek (table 3).

The importance of reducing duplication between the secondary and postsecondary levels cannot be minimized. Still, less duplication will not alone produce better educated and better trained individuals. Long et al (1986, p. 62) suggests that postsecondary instituions using advanced placement models are least likely to offer advanced skills instruction to advanced placement students because they must serve both students entering their programs through regular admissions as well as those entering with advanced standing. Some argue that time-shortened programs are mislabeled as two-plus-two programs. They may be more accurately called two-plus-one-and-a-half programs.

Advanced placement models, when used in conjunction with competency based two-plus-two models (discussed below), are likely to be more efficient, provide postsecondary faculties with better information on which to base the awarding of credit, and allow for curricular upgrading at both the secondary and postsecondary levels.

Advanced Skills Program Models -- Advanced skills programs focus on structuring secondary learning experiences to allow for more advanced training in vocational and technical programs at the postsecondary level. The two models representative of this type of program, the core curriculum or pretech model and the vocational technical model, normally require a secondary curriculum structured differently from the curriculum offered by existing secondary vocational education programs.

The core curriculum model seeks to better prepare students for entry into postsecondary technical programs through use of applied math and science, vocational courses, and supportive academic courses. A pilot program between Leander Independent School District (ISD) and Austin Community College to train and educate technicians in electronics/electromechanical systems, exemplifies this model. Using the Principles of Technology core curriculum developed by the Center for Occupational Research and Development (CORD), this pilot program is structured so that all students receive a common core of instruction consisting of a basic skills core and a technical core (table 4). Both of these areas are believed to be necessary for all technical students, regardless of their eventual specialty at the advanced skill level in post-secondary school.

While the major focus of core curriculum models is preparatory in nature, students are able to exit the education/training sequence at different points along the career ladder -- high school completion and entry into the job market, completion of a certificate at the postsecondary level, entry into the job market as a technician, or completion of the A.A.S. degree and employment as a master technician. Ideally, the education these students receive should provide a basis for continuing in college to more advanced degrees in engineering.

Another advanced skills model based on the concept of a core curriculum is the pretech model (table 5). It differs from the core curriculum model using the Principles of

Table 3. Sample Advanced Placement Model: Engineering Technologies Division

Public School Program	College Program	Credit Awarded
Machine Trades	Industrial Engineering Technology	QCT - 111
Drafting-Design Trades	Mechanical Engineering Technology Packaging Engineering Technology Quality Control Technology	INT - 111 DRT - 101
Electronics Trades	Electrical & Electronics Repair Technology	EER - 111 EER - 116 EER - 141
Automotive Trades	Automotive Technology	Depends on results of automotive mechanics achievement test

Source: Long et al. 1986. Avenues for Articulation: Coordinating Secondary and Postsecondary Programs. p. 91.

Table 4. Sample Core Curriculum Model Using Principles of Technology Core Technical Preparation for Electronics

11th Grade	12th Grade
English	English
Health/Physical Education	Health/Physical.Education
Social Studies	Economics (Psychology/History)
Principles of Technology I	Principles of Technology II
Mathematics (Algebra, Plane Geometry, Trigonometry)	Technical Specialty (Electronics, Drafting)
Computer Literacy	Computer Programming

Source: Brueder, Robert and Martin, William. 1985-86. "To Market, To Market." Community, Technical, and Junior College Journal. p. 35.

Table 5. Sample Pretech Core Curriculum Model Secondary Component: Biomedical Equipment Technology

11th Grade	12th Grade
Fall	Fall
English	English
Trigonometry	Algebra I
* Physics I	* Physics II
* Analog Devices	* Fundamentals of Electricity/Electronics
U.S. History	* Fluid Power
Elective	Elective
Spring	Spring
English	English
Trigonometry	Algebra II
* Physics I	* Physics II
* Analog Devices	* Fundamentals of Electricity/Electronics
* Mechanical Devices	U.S. History
* Pretech Core	Elective

Source: Long et al. 1986. Avenues for Articulation: Coordinating Secondary and Postsecondary Programs. p. 90.

Technology core in that academic, rather than applied, courses are utilized in developing the secondary core curriculum. Two-plus-two programs using this type of sequence are designed to prepare students at a higher level of competency for the more challenging vocational/technical programs at the postsecondary level.

The second model within the advanced skills programmatic structure, the vocational technical two-plus-two program, is believed to represent the epitome of two-plus-two articulation (Long et al., 1986, p .5). This model seeks to coordinate the eleventh through fourteenth years of vocational education through an integrated (i.e., combining academic and vocational course work) competency-based educational program which culminates with the A.A.S. degree. In some instances, this model requires a comprehensive curriculum jointly developed by both the secondary and postsecondary faculties as well as facilities jointly operated by the participating institutions. Vocational technical programs are designed to provide competency based exit points at the twelfth, thirteenth, and fourteenth grade levels. Some programs have been designed so that students are able to exit at the eleventh grade with entry-level skills required for a specific occupation. Close working relationships among administrators, teachers, and local employers are believed to be necessary for these programs to work successfully (Long et al., 1986, p.6).

The agricultural two-plus-two program in Kern County, California, between Bakersfield College and the Kern High School District, has resulted in a vocational technical curriculum which includes six different agricultural disciplines. Classes are held at an 88-acre agricultural facility, jointly operated by the high school and community college. Students enrolled in the program are able to exit at the twelfth, thirteenth, and fourteenth grade, with job competencies which relate to specific job titles in agriculture.

In response to changes in office information systems technology, the Dallas County Community College District has developed a vocational technical program to train and educate office personnel. Using data gathered from employers in the field, project planners engaged in extensive analysis of competencies needed for specific job titles in order to develop a competency based curriculum. Through the cooperative efforts of secondary curriculum developers and representatives from the community college, a curriculum has been devised which will allow students to exit the program at the diploma level, the cerificate /A.A.S. degree level, or the baccalaureate degree, resulting in a two-plus-two-plus-two format.

Table 6 shows an example of a vocational technical program which allows students to exit at the eleventh grade with marketable skills geared for a specific job title. Vocational technical programs, then, can incorporate a vocational component within the program without sacrificing advanced skills preparation. According to Long et al. (1986, p.62), in their efforts to provide students with the foundation for advanced training, core curriculum models appear to provide students with fewer job skills than do traditional vocational education programs. Mark Kincaid, instructor of the Principles of Technology course for the Leander ISD/Austin Community College two-plus-two program disagrees, arguing that high-school diploma students will be prepared for entry-level positions in the field of Instrumentation and Control. He bases his opinion on responses from surveys of Austin area employers (telephone interview, February 23, 1988).

Table 6. Sample Vocational Technical Model Mechanized Agriculture

11th Grade	12th Grade	13th Grade	14th Grade
Fall Semester			
History	Government	English	English/Technical Writing
English	English	Humanities	Behavioral Science
Math	Language	Fluid Pneumatics	Fitness
Physical Science or Chemistry	Math	Power	Farm Tractors
Intro. to Agriculture	Farm Power	Arc Welding	Elective
	Basic Auto	Elective	
Spring Semester			
History	Government	English/Speech	Humanities
English	English	Farm Fabrication	Fine Arts
Math	Language	Machine Shop	Fitness
Physical Science or Chemistry	Math	Elective	Elective
Intro to Agriculture	Farm Engines	Elective	Farm Small Engines
	Mechanics	Equipment Service & Operation	
H.S. Certificate Competency entry level fabrication & farm mechanics repair	High School Diploma Competency in mechanized agriculture	College Certificate Competency in service & operation	A.A.S.

Source: Long et al. 1986. Avenues for Articulation: Coordinating Secondary and Postsecondary Programs. p. 89.

Although the appropriateness of job-specific training at the secondary level remains a point of contention, there appears to be room in two-plus-two programs for training which relates to specific job titles. Such training would be a part of, not a hindrance to, preparation for advanced skill training.

IMPACT OF TWO-PLUS-TWO PROGRAMS ON SECONDARY VOCATIONAL EDUCATION

The models previously described suggest a wide range of possible influences of two-plus-two implementation on the structure of secondary vocational education as well as the type of education and training students could receive. To date, no evidence exists which ranks the effectiveness of one program model over the other. Advanced skills programs, however, appear to have characteristics in common with the trend for more highly skilled and more broadly educated individuals. The educational foundation that program participants are likely to receive will serve them well beyond their entry into the labor market, whether this takes place at the completion of the twelfth, thirteenth, and fourteenth grade levels.

The influence of technological advancements on jobs will increase over time. Many community colleges have already begun to respond by restructuring their programs to include greater technical emphasis (Breudera and Martin, 1985-86, p. 32). Advanced skills programs, through the use of either applied or traditional academic course material at the secondary level, will provide students with the necessary foundation to enter these advanced vocational training programs.

As noted above, advanced skills programs tend to be competency based. John Skinkle (1981, pp. 201-202) relates the merits of an entire vocational education system, which is competency based and individualized. Competency based programs have the potential of allowing for varying learning styles as well as varying rates of learning, which could prove beneficial for Texas's diverse student population.

Additionally, the inefficient process of school district by school distict course evaluation used by time-shortened programs has been alleviated somewhat through the development and use of standardized statewide competency profiles, which function much like high school transcripts. Post-secondary institutions using the advanced placement model need only to review the student's file in order to award college credit and are provided much better information about the type of foundation the student possesses for advanced training.

As might be expected, issues of "turf" could very well interfere with the restructuring of secondary and post-secondary vocational education programs. The resistance to change on the part of secondary institutions may require encouragement and support from the state if the process of upgrading vocational education is to proceed. Illinois, for example, funds CORD's Principles of Technology at a higher rate in order to encourage more school districts in the state to use the program. Texas may also need to investigate means to motivate school districts to participate actively in the process of change for secondary vocational education, lest two-plus-two become nothing more than a written contract between secondary and postsecondary institutions without accompanying changes in curriculum needed to complete the upgrading process.

Should Two-Plus-Two Programs be Separated from Existing Vocational Programs?

The foregoing discussion has focused on the importance of restructuring existing vocational education programs as a prerequisite to the implementation of two-plus-two programs. However, the introduction of two-plus-two programs at the secondary level is viewed by some as a separate track of study from programs which have traditionally been labeled vocational. Dale Parnell (1985, p. 146), for example, foresees a future high school enrollment pattern in which students are divided among College Prep/Baccalaureate programs, Tech-Prep/Associate Degree programs, and Vocational Education/Diploma programs, with the implication that each category of students receive different types of education. Should this view of two-plus-two implementation be adopted, the recurring conflict between vocational education's social and economic roles is likely to resurface.

While the need for a more highly skilled and broadly educated work force could be met by two-plus-two implementation, some students may be denied access to these programs. Advanced skills two-plus-two programs, in particular, require prerequisite or corequisite skills/knowledge prior to entry into a two-plus-two sequence. The Leander ISD/Austin Community College program for example, requires a course in pre-algebra before students enter the Principles of Technology sequence. As was noted above, pretech core curriculum models often require very strong basic skills in order for students to proceed through the sequence.

In Parnell's model, students unable to meet these requirements would be tracked into vocational programs. If two-plus-two programs are designed to meet the changing skill requirements of the labor market, what then becomes the function of Parnell's vocational education? The criticism of vocational education as a "dumping ground" for the low skilled would become a stark reality. Generally, a higher percentage of vocational education students score lower on ability tests, tend to have lower grade point averages by tenth grade, and tend to come from families of low socioeconomic backgrounds (Campbell, 1984, p.10). The possibility exists that this would be the population enrolled in Parnell's vocational programs. Upon completion of high school, this population of students would not be able to compete with their two-plus-two counterparts in the labor market. They would be relegated to those rapidly shrinking occupations which utilize unskilled or semi-skilled workers.

According to 1985-86 enrollment figures, 28 percent of Texas's secondary vocational education students were classified to have special needs (Advisory Council for Technical-Vocational Education, 1987, p. 6). Demographic projections for Texas indicate significant increases in the disadvantaged and Limited English Proficiency populations included in this special needs group. Texas can ill afford to implement educational programs, which in effect enhance the economic position of the state, without investigating a programmatic structure sensitive to the educational and training needs of this population.

CONCLUSIONS AND RECOMMENDATIONS

Two-plus-two programs present vocational education with the opportunity to continue its basic mission of training individuals for existing and expected jobs by upgrading the curriculum to meet the skill requirements of a changing labor market. Of the various models mentioned above, advanced skills programs appear to hold the most

promise for strengthening both the academic and vocational skills of those who will make up the work force of Texas.

The implementation of advanced skills two-plus-two programs is likely to stimulate issues of "turf" between secondary and postsecondary institutions. Secondary faculties will likely experience the brunt of the restructuring process and thus will need to see the value in relinquishing traditional modes of presenting vocational education. Resistance to change can be minimized by including all major players in the restructuring process (i.e., secondary faculties, postsecondary faculties, adminstrators, students, parents, and employers) in the initial stages of planning for two-plus-two implementation.

Not all students entering the two-plus-two sequence at the secondary level will continue at the postsecondary level. Postsecondary institutions do not offer free education and training, and some students are either unable or uninterested in continuing in school. Therefore, as an integral part of the program, the portions of two-plus-two programs in high schools should be directed to prepare diploma students to be employable for specific job titles.

In a similar manner, nothing appears to be gained by separating two-plus-two and traditional vocational programs. An extremely beneficial characteristic of two-plus-two programs is that all program participants receive better training and education, regardless of the point at which they exit the education/training sequence. Until ameliorating solutions are found for the crippling dilemma of the failure of significant numbers of students to acquire basic skills by completion of elementary school, intermediate measures at the secondary level must be sought.

Several features of advanced skills two-plus-two programs may aid in improving basic skills. Competency-based education, for example, allows material to be presented in an individualized manner, thereby taking into consideration various learning styles and rates of learning. Additionally, some students may benefit from the instructional methods used in teaching applied math and science, which are major components of some two-plus-two programs. Instructors at Leander High School are exploring the possibility of developing a course which would prepare students for applied math prior to their entry into the two-plus-two sequence. Undoubtedly, it would benefit both the Texas economy and individual students for more energy to be directed toward measures to include all students enrolled in vocational education in two-plus-two programs, rather than to focus on producing a separate curriculum for vocational students.

As school districts throughout Texas initiate steps to satisfy the state mandate for secondary/postsecondary articulation, the need for information regarding the various options for articulation will be of utmost importance. Various existing two-plus-two pilot programs offered by institutions across Texas provide an important source of data. The dissemination of the results of ongoing evaluations and of strategies designed to improve the articulation process will greatly support the restructuring and upgrading of vocational eduation throughout Texas.

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Acronyms

AAS	Associate Degree in Applied Science
CETA	Comprehensive Employment and Training Act of 1973
CORD	Center for Occupational Research and Development
CVAE	Coodinated Vocational Academic Education
DEC	Digital Equipment Corporation
GAO	General Acccounting Office (United States)
IBM	International Business Machines, Inc.
IDRA	Intercultural Development Research Association
ISD	independent school district
JTPA	Job Training Partnership Act of 1982
OJT	on-the-job training
PEIMS	Public Education Information Management System
PIC	private industry council
STIP	Skill Training Improvement Program
SOICC	State Occupational Information Coordinating Committee
TDH	Texas Department of Health
TDHS	Texas Department of Human Services
TEA	Texas Education Agency
TEAMS	Texas Educational Assessment of Minimum Skills
TEC	Texas Employment Commission

COMPLIANCE STATEMENT

TITLE VI, CIVIL RIGHTS ACT OF 1964; THE MODIFIED COURT ORDER, CIVIL ACTION 5281, FEDERAL DISTRICT COURT, EASTERN DISTRICT OF TEXAS, TYLER DIVISION

Reviews of local education agencies pertaining to compliance with Title VI Civil Rights Act of 1964 and with specific requirements of the Modified Court Order, Civil Action No. 5281, Federal District Court, Eastern District of Texas, Tyler Division are conducted periodically by staff representatives of the Texas Education Agency. These reviews cover at least the following policies and practices:

(1) acceptance policies on student transfers from other school districts;

(2) operation of school bus routes or runs on a non-segregated basis;

(3) nondiscrimination in extracurricular activities and the use of school facilities;

(4) nondiscriminatory practices in the hiring, assigning, promoting, paying, demoting, reassigning, or dismissing of faculty and staff members who work with children;

(5) enrollment and assignment of students without discrimination on the basis of race, color, or national origin;

(6) nondiscriminatory practices relating to the use of a student's first language; and

(7) evidence of published procedures for hearing complaints and grievances.

In addition to conducting reviews, the Texas Education Agency staff representatives check complaints of discrimination made by a citizen or citizens residing in a school district where it is alleged discriminatory practices have occurred or are occurring.

Where a violation of Title VI of the Civil Rights Act is found, the findings are reported to the Office for Civil Rights, U.S. Department of Education.

If there is a direct violation of the Court Order in Civil Action No. 5281 that cannot be cleared through negotiation, the sanctions required by the Court Order are applied.

TITLE VII, CIVIL RIGHTS ACT OF 1964; EXECUTIVE ORDERS 11246 AND 11375; TITLE IX, 1973 EDUCATION AMENDMENTS; REHABILITATION ACT OF 1973 AS AMENDED; 1974 AMENDMENTS TO THE WAGE-HOUR LAW EXPANDING THE AGE DISCRIMINATION IN EMPLOYMENT ACT OF 1967; AND VIETNAM ERA VETERANS READJUSTMENT ASSISTANCE ACT OF 1972 AS AMENDED IN 1974.

It is the policy of the Texas Education Agency to comply fully with the nondiscrimination provisions of all federal and state laws and regulations by assuring that no person shall be excluded from consideration for recruitment, selection, appointment, training, promotion, retention, or any other personnel action, or be denied any benefits or participation in any programs or activities which it operates on the grounds of race, religion, color, national origin, sex, handicap, age, or veteran status (except where age, sex, or handicap constitute a bona fide occupational qualification necessary to proper and efficient administration). The Texas Education Agency makes positive efforts to employ and advance in employment all protected groups.